Answers to Carrier Questions

Submitted by

MAVERICK CONSTRUCTION CORPORATION

"A Full Service Communications Construction Company"

With systems provided by:

MIKOM

AN ALLEN TELECOM COMPANY

THE CENTRAL ARTERY TUNNEL WIRELESS PROJECT

April 28, 2003

1) Pursuant to Section II A Item 4, each Carrier will receive two channels (or frequencies) for its own use within the system. Does this mean that each Carrier will have two connection points to each remote unit and should additional connection points be required that the Carrier pays for each or does this mean that each Carrier can connect only two channels to each Remote Unit? What is the bandwidth of each channel? What is the composite power of each channel?

Power levels are between 19 and 21dBm per channel.

2) Based on information to date, it appears that significant redundancy has been built into the system e.g. DWG page A20 depicts two sets of antennas within 400' of each other with different labels i.e. A-I90C-20A1 and A-CASB05A1. Is this so or are there other reasons for locating antennas in such proximity to each other?

Per the RFP, there must be continuous coverage in the even of a remote unit failure. Some of the remotes were placed to ensure coverage was still provided on the ramps in those instances.

3) In previous discussions, representations were made that indicated the public safety component of the Midas system added significant cost to the system. From Nextel's recent meeting with the MTA, we understood that this system's sole use would be for the wireless carriers. Is that correct? If so, what pricing impact will the removal of the public safety component have on the present system cost?

There is no cost impact in removing 800 MHz public safety since the 800 MHz trunking function is still required for Nextel. The cost savings were in removing 150 and 400 MHz.

4) Can you provide a detail of the hardware component of the annual O&M costs? Particularly in the earlier years where warranties should be still be in place.

There is limited equipment anticipated for the early years of the O&M period, however an assumption has been made to anticipate the replacement of portions of the system based on current reliability data. Additionally, not less than 5% of the total equipment installed shall be on hand at all times to ensure proper maintenance and response time.

5) Can you confirm that O&M fees represent a "capped" annual figure and no additional O&M fees will be allocated?

These costs are subject to the terms of Maverick's lease with the MTA and the clarifications on the O&M cost schedule.

6) What is the Link Budget MiKOM has taken in to account while designing the System?

The link budget was provided in the technical proposal.

7) What is the Minimum Ec will be available to subscriber traveling in vehicle (car/bus)?

Please explain Ec?

8) What is the battery back up - if so how many hours 1, 2 ,3 ....

UPS for up to 2 hours.

9) What is the expected Policy on

*	Monitoring	*24x7x365 at Maverick NOC*
*	Maintenance	*24x7x365 from Maverick NOC*
*	MTTR	*On scene within 1 hour per RFP*

and Responsibilities associated with each.

10) Will Mikom/Maverick upfit the equipment area for power, grounding, HVAC, etc?

Maverick has not included any power or supplemental HVAC or equipment to handle Carrier equipment or heat rejection – these requirements vary and are Carrier specific.

11) Will Mikom/Maverick provide the conduit or cable tray for GPS antenna cables and amounts?

Cable tray is included for installation at the Carrier interface locations in Vent building # 6 only.

12) Will the system have UPS power supply thru all components?

Yes, 2 hour backup per RFP.

13) Can Maverick/Mikom provide a line item project bid breakdown?

See attached information in format requested by the MTA

14) Can Maverick/Mikom explain its M&O plan, cost estimate breakdown and assumptions?

15) Is the system a one sector design and why? If so, how can the design support multiple carriers?

System is intended to be multi-sector due to the recommended limit of 8 remote units per sector.

16) Will Maverick/Mikom be using existing conduit, or pulling new conduit?

Maverick will utilize a combination of both existing and new conduit to facilitate construction of the system.

SCHEDULE A: FINANCIAL PROPOSAL FORM

I. SYSTEM COSTS

aa. Guaranteed Maximum System Price

US $	$15,359,732

bb. Central Office Design/Construction

Item	Amount
Central Office Design	$15,000
Equipment	$34,000
Installation (Labor)	$33,450
Materials	$0
- Equipment racks	$25,000
- Panels	$19,600
- Cable tray	$20,000
- Fiber troughs	$7,800
- Conduit	$7,100
- Cable	$14,817
- Hardware	$18,768
Carrier Interconnect	$ 138,000
Lighting,Cage,anti-static VCT	$ 15,932

cc. Vent Building 6 Construction (Caged Area)

Item	Amount
Design	$5,000
Equipment	$30,400
Installation (Labor)	$30,400
Materials	$15,000
Cable tray	$ 67,000
Splice boxes / backboard	$ 24,960

dd. Vent Building 6 Power Installation

Item	Amount
Design	$33,000
Equipment	$65,000
Installation (Labor)	$40,800
Materials	$9,250
- Conduit	$19,250
- Wire	$14,200
- Ground bars	$4,200
- Hardware	$7,000
- Transformers	$18,000
- Sub-meters	$4,400
- Circuit panels	$17,600
Back-up Power	$ 176,500.00
Lighting	$ 6,600.00

ee. Telephone Line Installation

Item	Amount
Design	$1,200
Equipment	$5,000
Installation (Labor)	$5,000
Materials	$5,000
Other (please specify)	

ff. HVAC

Item	Amount
Design	$3,000
Equipment	$42,000
Installation (Labor)	$28,000
Materials	$15,000
Other (please specify)	
NOTE: this is not anticipated to	
be necessary due to min. heat rejection	

gg. Vent Building 6 Tunnel Access

Item	Amount
Design	$15,000
Equipment	$317,130
Installation (Labor)	
- Verifying available conduit	$24,025
- Locating innerduct	$158,565
- Pulling/splicing/testing fiber optic cable	$400,485
Materials	$75,000
- Rigid galvanized steel conduit (unit price per foot) $ 42.00 / ft	$0
- Fiberglass reinforced epoxy conduit (unit price per foot) $ 55.00 per ft	$0
Details / Tunnel access	$ 52,500

hh. Utility Room Design/Construction

Item	Amount
Design	$20,000
Equipment	$20,000
Installation (Labor)	$20,000
Materials	$20,000
Details / Tunnel access	$ 36,000

ii. Utility Room Power Installation

Item	Amount
Design	$50,000
Equipment	$3,280,170
Installation (Labor)	$220,000
Materials	$60,000
- Conduit	$14,350
- Wire	$14,450
- Ground bars	$10,250
- Hardware	$4,120
- Transformers	$39,200
- Sub-meters	$48,000
- Circuit panels	$48,000
- Backup power materials	$280,000
Details / Tunnel access	$ 72,960

jj. Utility Room Tunnel Access

Item	Amount
Design	$22,000
Equipment	$1,200,000
Installation (Labor)	$60,000
- Verifying available	$24,000
- Locating innerduct	$192,000
- Pulling/splicing/ testing fiber optic cable	$1,042,720
- Coring utility room walls	$80,000
Materials	$63,000
Details / Tunnel access	$ 45,000

kk. Public Safety

Item	Amount
Engineering	$20,000
Equipment	$3,167,000
Installation (Labor)	$1,599,600
Power	$144,000
Backup power	$180,000
Telephone circuits	$500
Materials	$80,000
Other (please specify)	

ll. Remote Control/Monitoring

Item	Amount
Design	$5,000
Equipment	$22,000
Installation (Labor)	$21,000
Materials	$5,000
Communication lines	$2,200
Recurring fees - $ 7,000 annlly	$0
NOC / Rent - $ 6,600 mnthly	

mm. Redundancy

Item	Amount
Design	$15,000
Equipment	$341,320
Installation (Labor)	$246,720
Materials	$48,000
Access Details	$ 22,800
Mnthly Recurring - dark	
fiber lease - $15,000	

nn. System Turn-Up, Testing and Commissioning

Item	Amount
Creation of Test Plan	$15,000
Equipment	$42,000
Labor	$220,000
Materials	$22,000
Turn-up	$36,000
Testing	$0
Commissioning	$0
Details / Tunnel Access	$ 33,440

II. OPERATION COSTS

Year:	1 2003	2 2004	3 2005	4 2006	5 2007	6 2008	7 2009	8 2010	9 2011	10 2012
Total Maintenance and Repair Costs	$717,000	$717,000	$717,000	$795,000	$795,000	$845,000	$970,000	$970,000	$995,000	$995,000
Equipment	$175,000	$175,000	$175,000	$175,000	$175,000	$225,000	$225,000	$225,000	$250,000	$250,000
Labor	$542,000	$542,000	$542,000	$620,000	$620,000	$620,000	$745,000	$745,000	$745,000	$745,000
Total Utility Costs	$216,000	$216,000	$216,000	$216,000	$216,000	$216,000	$216,000	$216,000	$216,000	$216,000
Total Future Capital Upgrades	$0	$0	$1,830,000	$0	$0	$1,830,000	$0	$0	$0	$0
Equipment	$0	$0	$1,550,000	$0	$0	$1,550,000	$0	$0	$0	$0
Labor	$0	$0	$280,000	$0	$0	$280,000	$0	$0	$0	$0

III. VENDOR FEES

Year:	1 2003	2 2004	3 2005	4 2006	5 2007	6 2008	7 2009	8 2010	9 2011	10 2012
Projected Fee Cash Flow	$71,700	$71,700	$71,700	$79,500	$79,500	$84,500	$97,000	$97,000	$99,500	$99,500

Assumed Rate of Inflation:	6%	per Annum

Please state any additional assumptions in the area provided below:_____ 1) Includes reconfiguration of the system by carrier request up to 3 times a year 2). Includes on site equipment vendor technical support 3). On-going training for service employees by equipment provider 4). Attic / replacement stock purchased annually for the system 5). Excludes all governmental access fees that may be imposed. 6). Utility costs incluide a ten year agreement for two (2) redundant 432 F backbones as described of which the construction cost is amortized in the lease over a ten year period. 7). 2005 future upgrade includes a 3rd remote at 40 locations 8). 2008 future upgrades include adding a 4th remote at 40 locations.

Note: The dark fiber lease in note 6, can be reduced if the construction cost is not amortized, but funded by the carriers.

SYSTEM OPERATIONS MAINTENANCE SCHEDULE					
Item / Description			**Frequency**		
	daily	weekly	monthly	qrtly	annually
System monitoring via OMC	■				
Daily log - system report	■				
Resoration and Maintenance reports		■			
Drive down - visual inspections		■			
Tagging and labeling inspections			■		
UPS and Battery maintenance			■		
Splice Continuity - OTDR testing					■
Customer Contact information updates				■	
Emergency notification list updates				■	
Power level verification					■
Disaster Recovery Review					■
Disaster Recovery Simulation					■

Vendor Answers to Questions

Volume II

Submitted by

MAVERICK CONSTRUCTION CORPORATION

"A Full Service Communications Construction Company"

With systems provided by:

MIKOM

AN ALLEN TELECOM COMPANY

THE CENTRAL ARTERY TUNNEL WIRELESS PROJECT

February 11, 2003

WRITTEN ANSWERS TO QUESTIONS

1. Provide the data sheet for the MIDAS Master Unit, with a description of how its performance matches the Remote Unit for this application.

   Mikom does not have a separate data sheet for the MIDAS Master Unit, but we do have a generic Optical Master Unit data sheet and User's Manual for the MIDAS Master Unit, both of which are included with this reply (Attachments A and B, respectively). The specifications of the Remote Unit are what are used to design a particular coverage solution, which is why these details are provided in a concise, easy-to-reference data sheet format. The Master Unit matches the Remote Unit operating parameters (i.e. frequency, optical performance, etc.) but is only taken into consideration when commissioning the system, which is why a separate data sheet is not normally needed, especially considering that each remote interfaces exclusively with one optical transceiver in the optical master.

2. Based on Maverick/Mikom's actual experience, what is the maximum fiberoptics loss, in terms of dBo and in terms of physical distance, given the maximum number of splice points expected in this installation?

   The maximum fiber optic loss for the MIDAS equipment is 10 dB. Average single-mode fiber optical losses are 0.5 dB/km for transmission, 0.1 dB loss for fusion splices, and 0.5 dB loss for connectors (both ends). The Maverick/Mikom Proposal calls for home runs from the Master Unit in Vent Building 6 to each equipment location so the splicing will be limited to the fiber pigtails at each end of the fiber. Total optical loss expected for 2 splices with 4 connectors (2 pigtails and 1 fiber jumper cable at master unit) or 1.2 dB plus transmission losses for up to 17.6 km or 10.6 miles.

3. How is auto-leveling accomplished, in particular, as Carriers are added to or subtracted from the System?

   The MIDAS equipment auto-leveling function is used to compensate for the optical fiber losses between the Master and each Remote Unit, and it automatically adjusts the gain at the Remote Unit to maintain the specified power output per channel or carrier. The automatic threshold controller (ALC) in the Remote Unit sends an alarm when the transmit (or receive) power level exceeds the specified power output. This ensures that a Carrier can't increase their individual power per channel/carrier to improve coverage at the expense of other Carriers' operations.

   The power per channel/carrier into the Master Unit is a fixed level that is set when each operator is added to the System, and it will be the same for each Carrier within a frequency band irrespective of how many channels/carriers they are transmitting. Once a Carrier is connected to the system, they can add or subtract their individual channels/carriers at their Base Station Equipment without anyone having to adjust the levels into the Master Unit as long as the total number of channels/carriers for all of the Carriers within a frequency band does not exceed 32 at the Remote Unit. Please note that we have increased the number of TDMA/GSM channels from 24 as stated in our proposal

to 32 to simplify the capacity management of the system, and that this does not affect the Maverick/Mikom Tunnel System design.

Only qualified Maverick/Mikom personnel will be allowed to add radio equipment or make sector configurations changes to the System. This ensures that the proper interconnection equipment is installed and attenuation settings are made to maintain the appropriate power levels into the Master Unit.

4. The System proposed for this application uses two "side-by-side" dual-band antenna systems: one carries selected PCS and all Trunking carriers while the other carries PCS and all Cellular carriers. The figure on page 8 of your proposal shows a Dual-Band Master Unit with connections of up to 8 carriers, driving, via a single fiber, a dual-band remote unit shown on page 9, which in turn drives a single dual-band antenna. The data sheet for the remote unit indicates capacity for up to 4 duplexed ports and 32 carriers in each of the 800MHz and the PCS sections. Is the proposed "side-by-side" dual-band antenna system a single master/single remote/single antenna configuration, two such configurations, or a combination thereof? Describe in more detail which frequencies/frequency bands are carried in each dual-band antenna system, and the basis for the proposed allocation.

The MIDAS System will use two "side-by-side" dual-band systems, each with their own Master Unit, Remote Units, and antennas. One dual-band system will serve some PCS and all cellular Carriers, and the other system will serve the other PCS Carriers and all 800 MHz trunking Carriers. There are at least 6 PCS licenses nationwide (A, B, D, E, and F with at least one C), so there should be sufficient PCS ports available between the two dual-band systems without having to add external connections. Also, since there is more spectrum available for PCS than there is for cellular, using two dual-band systems provides the additional capacity needed for PCS as well.

Each Remote Unit has its own separate interface at the Master Unit. This interface includes 8 built-in duplexed ports, 4 for the high band and 4 for the low band, which are connected internally to the individual optical transmitter/receiver and then via the single fiber to the appropriate Remote Unit. There are up to 15 interfaces available in each Master Unit cabinet, and each dual-band system is composed of three Master Unit cabinets. The term "Master Unit" is used to describe the cabinets collectively since the control unit is common to all of the cabinets that make up a dual-band system.

Each Remote Unit supports up to 32 channels/carriers in each frequency band (32 in the high band plus 32 in the low band). There are separate amplifier paths in the Remote Unit for each frequency band, which is why the channel/carrier capacity is determined separately for each frequency band.

5. What is the minimum spacing between the dual-band antennas needed to prevent self-interference?

The Maverick/Mikom System will use a minimum of 3 ft spacing between the antennas, which results in 44 dB isolation at 851 MHz and 59 dB at 1950 MHz (Isolation = 28 + 40*log(spacing in feet/wavelength in feet)).
There are two types of potential interference between the two parallel systems: 1) broadband noise from 800 MHz trunking desensitizing the 800 MHz cellular uplink and 2) downlink signals causing interference between the two PCS systems. The latter is truly not a problem as the PCS portions of the remotes can tolerate the full output power reflected from a 0 dB return loss with no damage to the unit. And the actual power levels received into one TX port of a unit from the other is –27 dBm/channel, substantially lower than the –13 dBm limit set by the FCC for self-induced spurious outputs.

As to the desensitization of the 800 MHz cellular by the 800 MHz trunking, with the minimum spatial isolation of 44 dB and wideband noise out of the trunking unit of –97 dBm/Hz would yield a noise input power of –141 dBm/Hz. Additional rejection by the trunking duplexer will also assist. As this is above –174 dBm/Hz thermal noise, Mikom has also placed a specialized notch filter between the trunking unit and its antenna to provide an additional guarantee of 40 dB rejection. This shall reduce the thermal noise to –181 dBm/Hz, under standard thermal noise.

6. Provide a more complete description as to how the dual-band antenna system would be accommodated on the PCS, cellular and 800MHz radio frequencies, including physical allocation of radio cabinets in the URs and in VB-6. The Authority has determined that no public safety 800MHz frequencies were included, therefore, what would be the configuration of the dual-band antenna system to accommodate the 6 PCS bands and the 2 cellular bands? Given the star configuration, is a master/remote pair assigned to every remote location?

As stated in reply to question 4, two dual-band systems installed side-by-side are be required to serve the licensed Carriers for PCS, cellular, and trunking frequencies. One dual-band system would serve some PCS and all cellular Carriers, and the other would serve other PCS Carriers and all 800 MHz trunking Carriers. Although the Authority has determined that 800 MHz trunking frequencies are not required, there are other licensed 800 MHz trunking Carriers, such as Nextel, which would very likely want service on the Tunnel System. The 800 MHz trunking Carriers can not share the 800 MHz cellular equipment due to the limitations of the duplexers used in the MIDAS equipment.

If only one dual-band system for PCS and cellular service were required, the PCS operators could be combined externally to limit the inputs to the Master Unit to the 4 duplexed ports available. Each Remote Unit would still be limited to 32 channels/carriers in each frequency band (32 in the high band plus 32 in the low band). There would be only one Remote Unit and one Master Unit interface (or master/remote pair) for each remote location in that instance.

7. The proposal mentions "one master unit system." (page 16). Please clarify this definition.

The "Master Unit System" is composed of multiple Master Unit cabinets that share a single controller and are seen as a single entity by the Operations and Maintenance Control (OMC) software. Each dual-band system will have its own controller so the OMC will actually see two Master Units located in Vent Building 6, one for PCS/cellular and one for PCS/trunking. For simplicity since the cabinets will be installed adjacent to one another, they are referred collectively as the Master Unit System.

8. Equipment currently installed below the CA/T (roadways and URs) are specified to operate over an ambient temperature range between –30 degrees to +60 degrees Celsius ("C"). The remote unit is specified for –33 degrees to +50 degrees C. Is the upper limit extensible to +60 degrees C?

The Remote Units may operate in a degraded mode above +50 degrees C, but depending on the loading on the amplifiers at any given time (number of carriers/channels active) there is the potential for certain remotes to shut themselves off to protect the internal components from permanent failure. After the temperature of the amplifiers returns to a non-critical level, they will turn back on. This allows the system to survive to temperatures of +70C.

9. How are the various LMT and OMC connected and integrated within the System? Provide a description of the software and the terminal equipment used in both locations, and the functional relationship between the OMC and the LMT. Are all diagnostics/alarms carried over the 10.7MHz supervisory signal? Is the LMT, like the OMC, SNMP based? Is Open View used for display of SNMP information?

A diagram of the OMC platform for the MIDAS system is included as Attachment C and may prove useful in understanding how the software systems work together.

The LMT uses a Windows platform and runs on a standard PC housed in the first Master Unit cabinet. There will be two LMTs in the Tunnel System, one for the PCS/cellular system and one for the PCS/trunking system. The LMT connects to the Master Unit controller software to provide a visualization to monitor and control the Remote Units served by that Master Unit. The Master Unit controller software uses the 10.7 MHz supervisory signal to provide communications with all of the MIDAS equipment . The Master Unit controller software also forwards all information to the OMC Server.

Both Master Unit controllers' software will be connected by an "always-on" LAN connection to a remotely located PC that runs the Windows-based OMC Server and OMC Client software. The OMC Server is able to monitor and control multiple Master Units, and it continuously polls the Master Units. Since the Master Unit controller is always on, it automatically forwards any alarms to the OMC Server

The OMC Server is SNMP-based to allow other users to access information from all of the networks managed by that OMC Server using their local OMC Client software and a LAN or dial-up connection. The OMC Server will immediately forward any alarms it

receives, and those alarms can be forwarded via SMS, fax, or to another SNMP-based platform. The protocol used is MIKOM Protocol/UDP/IP and FTP/TCP/IP.

The OMC Client software is required to visualize the information from the OMC Server, and all of the functions available with the LMT are also available with the OMC Client, depending on the user rights granted. The OMC Client runs on Windows 2000. The OMC also records all of the system information, such as model numbers, software versions, settings, current status, etc.

10. Provide information regarding the use of built-in test equipment, if any (reference RFP Sections II-A.5 and IV-C.2.f).

The MIDAS equipment uses a built-in controller located in the Master Unit to monitor and control the Master Unit and all included Remote Units. Attachment B- MIDAS Master Unit Manual explains in detail the functions available and how they are accessed and modified.

The following functions are monitored and will create an alarm if there is a degradation or failure:

Function	**Alarm Description**
Optical RX	Optical receive failure (no input)
Optical TX	Optical tranmsit failure
Auto-leveling	Optical loss has changed
Amplifier current Downlink 1 (DL1)	Amplifier current too high or too low
Amplifier current Downlink 2 (DL2)	Amplifier current too high or too low
Automatic Threshold Controller Downlink (ALC DL)	Output power too high
Automatic Threshold Controller Uplink (ALC UL)	Input power too high
Temperature	Temperature out of range
Internal Communications Bus	Internal communications bus failure
Power Supply Unit 12 V (PSU 12V)	Power supply 12V failure
Power Supply Unit 28 V (PSU 28V)	Power supply 28V failure
Power Supply Unit mains (PSU mains)	Power supply mains failure
Fan	Fan out of order
External alarm 1	Option for supervision of external components
External alarm 2	Option for supervision of external components
External alarm 3	Option for supervision of external components
External alarm 4	Option for supervision of external components

All of the above functions are forwarded from the Master Unit controller to the LMT and the OMC Server and processed as described in Question 10.

11. Are the base stations provided by the Carriers continuously monitored for acceptable performance (e.g., by measuring RF signal power, S/N ratio and noise floor against operating limits)?

The Master Unit detects and will report the composite power available within the frequency band at the Remote Unit, but it does not differentiate between the various operators within that frequency band. Maverick/Mikom will have technical staff available to work closely with the operators to quickly diagnose and repair any performance issues suspected to be caused by the MIDAS Tunnel System.

Separately a measurement receiver will be available starting at the end of 2003 for CDMA; upgrades for GSM and TDMA will be available mid-2004; and iDEN shall be available if the specification is available for such measurements. The Carriers will be able to purchase these measurement receivers (located both at the Master and Remote Units) when they become available, but they have not been included in the Tunnel System Proposal.

12. How are sectors assigned? Is it the intent to permit different Carriers to mix and match the assignments to different sectors, and permit for changes over time? How is a change implemented? Illustrate with a scenario, including consideration for handoff, relating to the configuration in Attachment G.

It is Maverick/Mikom's intention to permit the Carriers to mix and match their base station sectors to the Remote Units independently of the other Carriers. Maverick/Mikom will work closely with the Carriers to develop their sector configurations before they are physically added to the MIDAS System, and each Carrier will receive a handover package detailing their configuration and the applicable data readings after they are connected. Carriers will be permitted to make changes over time following a very similar procedure as part of the Maintenance Contract.

Attachment D Sample MIDAS MU Configuration is an example of how the operators might connect to Phase I of the Tunnel System using different interconnection equipment and BTS sector-RU configurations. There are 3 tabs to the spreadsheet:

1) BTS Configuration to show the various types of BTS sectors that have to be taken into account in the connection;
2) Remote Configuration to illustrate how the BTS sectors might be split across various remote units by each operator; and
3) Master Unit Configuration to show how the BTS connections are made at the MU.

The handoffs between the Remote Units are subject to the Carrier's needs although Maverick/Mikom technical staff will be available to help them make those decisions.

13. Provide your rationale for the parameters included in Attachment F–Link Budget, Public Safety Services.

The link budget for Public Safety was based on the available power output per channel available from the Mikom MOR equipment while taking into account the cable losses, antenna gain, fade margins, in-vehicle attenuation, required SNR of 9 dB, assumed handset power and noise figure, and distance to the antenna. It shows how the system would be downlink limited but still provide an acceptable mobile receive level using the proposed Remote Unit locations.

14. Qualify the statement (page 12) that Carriers will be limited to a maximum of 8 Remote Units per sector, otherwise negatively affecting uplink call quality in relation to the other Carriers operating within that boundary.

The noise added to the system increases logarithmically as the number of Remote Units serving a single sector is increased. With greater than 8 remote units to a sector, the system can become uplink limited for some technologies, which means that those base stations would not be able to process a call in the areas with larger link budgets even though there was sufficient downlink signal available in those sections of the Tunnel.

15. What is the expected network path delay, network path loss, noise floor, signal rejection (e.g., at duplexers) needed to prevent interference?

The FCC standard for intermodulation (and all other spurious emissions) is –13 dBm for all technologies except CDMA that also has a –45 dBc for spectral re-growth. Mikom uses a tighter specification of approximately –30 dBm to ensure there are no problems in our multi-operator, multi-technology systems.

Delays through the system are primarily set by the differences in the fiber lengths. Since the fiber lengths differences are all within less than 1 km, the network path delay differences between two Remotes shall be less than 4.7 us. This delta is acceptable to all wireless standards for multipath interference issues. Network noise floors were examined in question 5 to show there is no problems with system interference, and of course, they are compliant with the FCC requirements.

16. What is the expected minimum uplink RF signal at the Carrier interface point for a specific Carrier mobile uplink signal?

The expected minimum uplink RF signal at the Carrier interface point for a specific Carrier mobile uplink signal would depend primarily on the power output and sensitivity of the mobile. The maximum allowable downlink pathloss (from the Remote Unit to the mobile) determines the maximum allowable uplink pathloss system (from the mobile to the Remote Unit) in a balanced. If the maximum allowable downlink pathloss were 119 dB, for example, then the maximum allowable uplink pathloss would be 119 dB. This would translate to a minimum uplink RF signal at the Remote Unit of –89 dBm for a handset with a maximum power output of 30 dBm and a signal level of approximately –67 dBm at the Master Unit.

17. What is the expected minimum downlink RF signal at the Carrier interface point for a specific Carrier mobile downlink signal? What is the maximum permitted RF downlink signal and the maximum allowed noise floor?

The downlink RF signal at the Carrier interface point will be approximately 0 dBm for all Carriers, and the duplexed ports at the Master Unit interface are equipped with variable attenuators to ensure that the proper level is set for each individual connection.

The maximum allowed noise floor is dependent on the Carrier's technology, BTS sensitivity, and performance standards. Mikom has specifically limited the number of Remote Units to a particular sector to 8 to ensure the added noise from the MIDAS System doesn't exceed 15 dB, which should be sufficient for all current technologies without requiring excessive Carrier equipment.

18. Provide details and milestones showing how the project will be completed in 9 months. How will the 30-day interference study (page 18) and any corrective action necessary as a result of this study, fit within this schedule?

It is anticipated that the schedule will follow these approximate milestones:

Construction Start	
Design and Engineering	4 weeks
Permitting	2 weeks
NOC Facilities Construction	8 weeks
Construction – VB-6	4 weeks
Construction Phase 1	10 weeks
Construction Phase 2	8 weeks
Construction Phase 3	8 weeks
Commissioning / As-builts	4 weeks

***** A complete project schedule will be developed and delivered upon execution of the Notice to Proceed.***

As demonstrated in Maverick / Mikom's proposal, a significant amount of engineering and design has been completed already. We have done this to accelerate our ability to complete engineering and begin construction quickly. Aspects of the work will overlap and the overall construction schedule will ultimately hinge on the completion and turnover of the Phases from the Central Artery Tunnel to the MTA.

Additionally, the 30-day interference study will commence as soon as the Notice to Proceed is issued. The licensed frequency bands and technologies for each operator are known as well as the equipment specifications so the study can commence without affecting the construction schedule. Any corrective action will be taken in allocating the Carriers to the two dual-band systems or adding additional equipment, such as notch filters at the Remote Unit locations. It is anticipated that this study will occur during final engineering and design.

19. With respect to a description of the MIDAS System, what is the address of the NOC you propose?

20. Maverick currently has a mini-NOC at it's Hyde Park location in Boston, and additional real estate holdings in South Boston. It is our intent to construct a new full service Operations Center in South Boston, proximate to the project location. The proposed address is # 3 Herald Place, South Boston. This facility will house a full-service Network Operations and Control Center with storage, office and conference space, kitchen, shower and locker facilities.

21. What operating system is utilized on the OMC and LMT? Explain how security will be implemented on these systems.

Windows 2000 is the operating system for both the OMC and LMT. User names and passwords will be used to limit access to the systems. It is anticipated that a Citrix server will be utilized for carrier access. Citrix allows any PC with a browser and internet connection to securely and safely use all applications and devices located on a remote network. Citrix Secure Gateway is an enterprise-wide solution that protects the network infrastructure, data and applications. Citrix traffic traversing the internet between client devices and the Citrix Secure Gateway server is encrypted using the internet standard SSL technology, ensuring the secure transfer of data across public networks.

ATTACHMENT A

370 MHz - 2.2 GHz

PRODUCT DATA SHEET

Extending Wireless MIKOM AN ALLEN TELECOM COMPANY anywhere

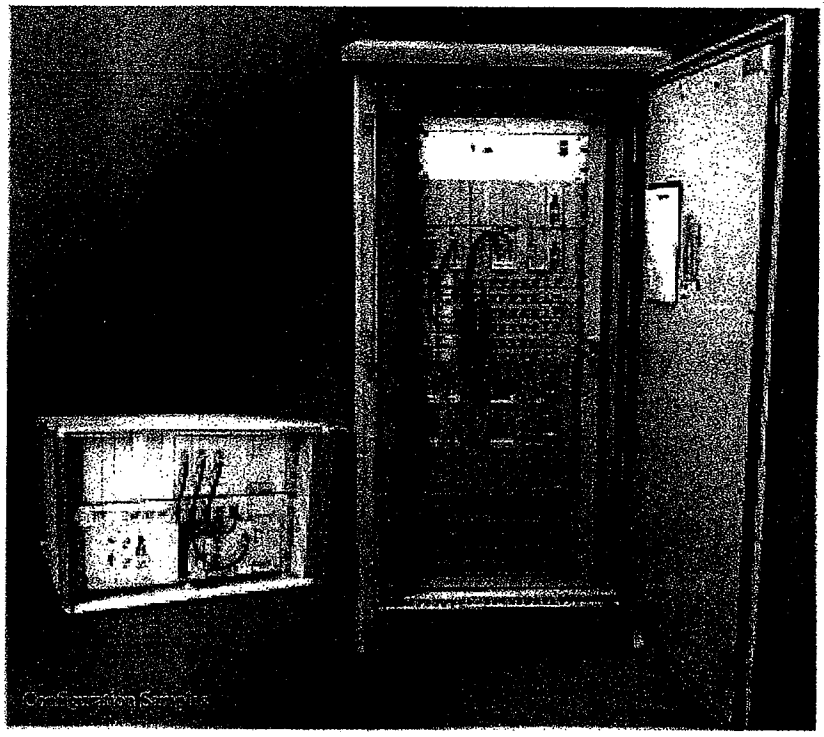
Optical Master Unit

Multiple Standards

- **Available for virtually every mobile communication standard (e.g. GSM, PCS, UMTS, Tetra, ...)**
- **Handles up to 124 Remote Units**
- **Large variety of different in- and outdoor cabinets available**
- **Modular expandable concept**
- **Accessible locally via RS232 and remotely via PSTN or GSM modem**
- **Multi standard and multi operator operation possible**
- **Air interface or coupling from BTS**

The Optical Master Unit is a central unit that controls, feeds and supervises Optical Remote Units (*) via optical fibre. The combination of one or several Remote Units and the Optical Master Unit results in an optical distribution system for RF signals. By use of such a system, coverage can be provided to both indoor and outdoor locations where satisfactory quality of communication is not available.

The system parameters can be set locally or remotely via PSTN or GSM modem. The design of the system comprises a large number of functions, which the operator may monitor via MIKOM LMT (local maintenance terminal) or MIKOM OMC software platform. This easy to use software allows the operator to supervise the entire system.



(*) Specific datasheets are available for a wide range of Remote Units for most Standards.

MIKOM AN ALLEN TELECOM COMPANY

108 Rand Park Drive • Garner, North Carolina 27529

TCI OPTICS

Optical Master Unit

Multiple Standards

ELECTRICAL SPECIFICATIONS

Frequency range	370 MHz ... 2.2 GHz
Gain	Determined byspecific Remote Unit
RF Input Power Range @ BTS port	+50 dBm ... -10 dBm composite (incl. combining unit)
RF output power	Determined byspecific Remote Unit
Noise Figure	Determined by actual configuration
RF connectors	N- female or 7/16-female
Power supply	+18..+36VDC, ±48VDC, 115VAC, 230VAC
Power consumption	Determined by actual configuration, 20W for min configuration
Built in test equipment	Monitoring of connected Remote Units

OPTICAL SPECIFICATIONS

Optical output power	0 .. 5 dBm
Optical transmitter wavelength	1310±20nm or 1550±20nm
Optical receiver wavelength	1200nm .. 1600nm
Min. optical return loss	45 dB
Max. optical loss to Remote Unit	10 dB (typ. opt. loss of fibre: 0.3dB/km)
Optical fibre type	single mode E9/125
Optical connectors	E2000APC, DIN/APC, FC/APC, SC/APC

MECHANICAL SPECIFICATIONS

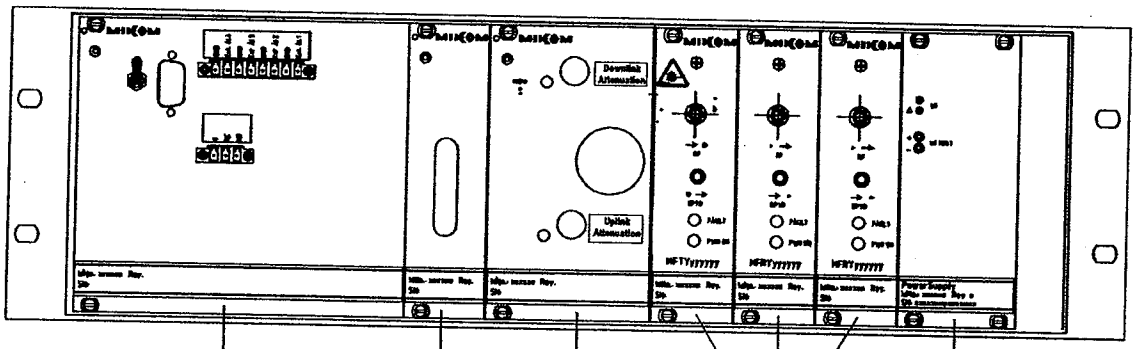
Height, width, depth:	Depends on application
Weight:	Depends on application
Environmental and SafetyTemperature range	Up to -33 °C ... +50 °C , depends on application

Optical Master Unit

Multiple Standards

CABINET EXAMPLES

Example: Basic Subrack



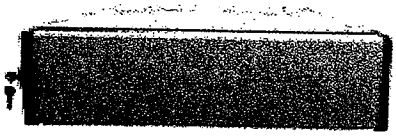
Remote Control (standard)

Modem (option)

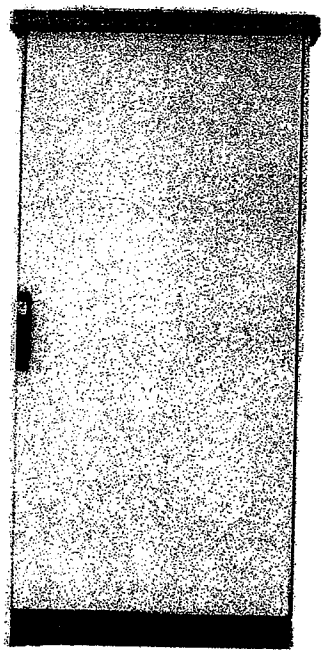
Attenuator Kit (optionally)

Optionally Configurable

1x Power Suppoly Kit (standard)



Example: Indoor Cabinet



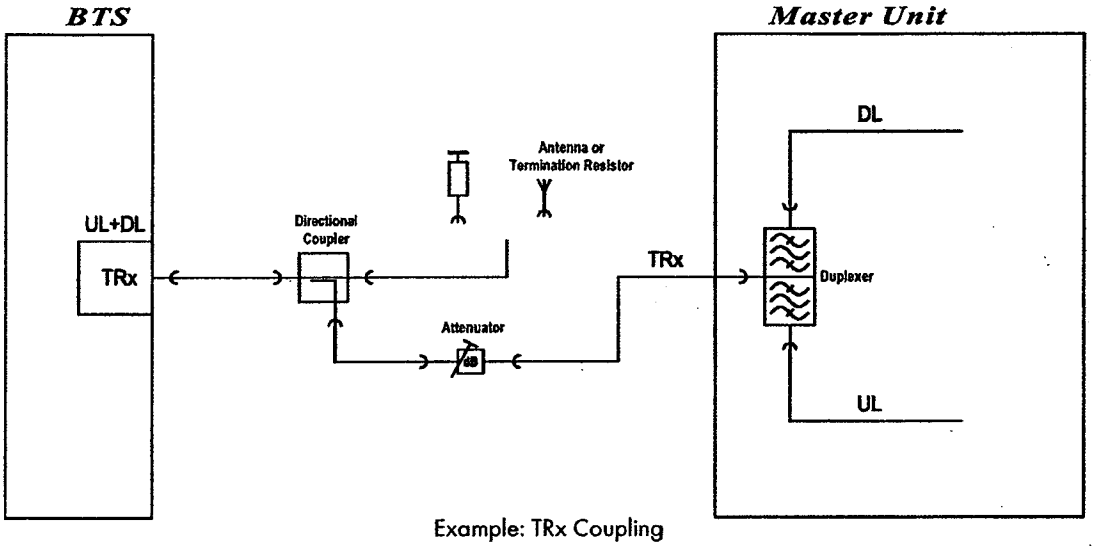
Example: Outdoor Cabinet

Extending Wireless MICOM AN ALLEN TELECOM COMPANY anywhere

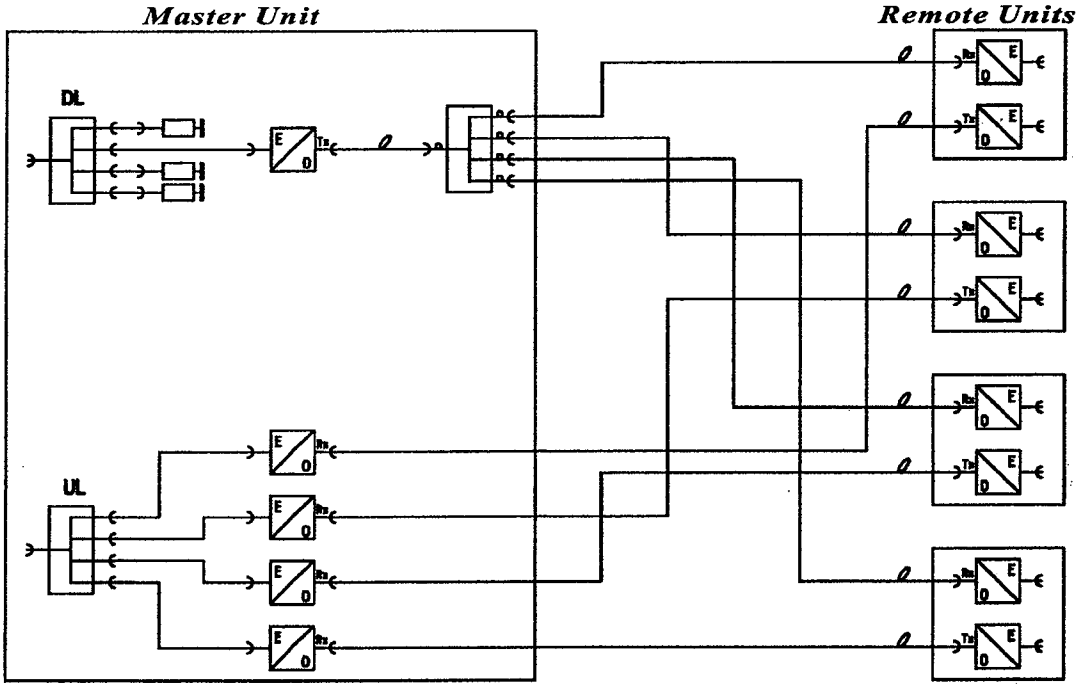
Optical Master Unit

Multiple Standards

DESIGN PRINCIPLES



Example: TRx Coupling



Example: Star Configuration with Opt. Splitter

MIKOM
AN ALLEN TELECOM COMPANY

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ATTACHMENT B

LIST OF FIGURES AND TABLES

For your notes

1. GENERAL

1.1. PREAMBLE

MIKOM is a leading manufacturer of coverage equipment for mobile radio networks, specializing in low cost, high performance, RF and optical repeaters. Our optical distributed networks and RF repeater systems provide coverage for every application; outdoor use, indoor installations, tunnels, subways and many more.

MIKOM has engineering and manufacturing facilities in Germany, Italy and the USA. In addition, MIKOM maintains many field engineering and sales offices throughout the world.

MIKOM GmbH operates a quality management system which complies with the requirements of ISO 9001. All equipment is manufactured using only highly reliable materials. In order to ensure constant first-rate quality of the products, a comprehensive quality assurance has been conducted at all fabrication stages. Every component leaves the factory only after a thorough final acceptance test, accompanied by a test certificate guaranteeing optimal function.

The declaration of conformity for the product is available on request via the local sales office or Mikom directly.

Any intervention must be carried out by authorized persons only. If technical assistance for the product is required, please contact the local sales office or contact MIKOM directly at one of the following addresses:

MIKOM GmbH
Industriering 10
86675 Buchdorf
Germany
Phone: +49 (0) 9099 69 0
Fax: +49 (0) 9099 69 930
E-mail: sales@mikom.com
http://www.mikom.com

for The Americas:

MIKOM US
Phone: +1 (0) 800-800-7465
E-mail: MIKOM_US_sales@allentele.com

When set-up is performed according to this manual, the system will operate without complications for a significant length of time.

1.2. HEALTH AND SAFETY WARNINGS

1. Only suitably qualified personnel should work on this unit and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual.

2. Read and obey all the warning labels attached to the unit. Make sure that the warning labels are kept in a legible condition and replace any missing or damaged labels.

3. Obey all general and regional installation and safety regulations relating to work on high voltage installations, as well as regulations covering correct use of tools and personal protective equipment.

4. Keep operating instructions within easy reach and make them available to all users.

5. It is the responsibility of the network provider to implement prevention measures to avoid health hazards which may be associated to radiation from the BTS to which the unit is connected.

6. Make sure, access is restricted to qualified personnel.

7. Use this equipment only for the purpose specified by the manufacturer. Do not carry out any modifications or fit any spare parts which are not sold or recommended by the manufacturer. This could cause fires, electric shock or other injuries.

8. Before working on active components of the unit, disconnect mains.

9. ESD precautions must be observed! Before commencing maintenance work, use the available grounding system to connect ESD protection measures.

10. This unit complies with European standard EN60950.

11. Make sure system settings are according to the intended use (see also product information of manufacturer) and regulatory requirements are met.

12. Laser radiation – Class 1! Do not stare into the beam, do not view it directly or with optical instruments.

1.3. INTERNATIONAL SALES OFFICES

Allen Telecom Inc. 31225 Bainbridge Road, Suite J, Cleveland Ohio 44 139-2293 USA Phone: +1 (440) 519-2629 Fax: +1 (440) 519-8607	**Allen Telecom Pty Ltd** 6 Stuart Street Padstow NSW 2211 Australia Phone: +61 (2) 9774-4200 Fax: +61 (2) 9774-4500	**Mikom France** Z.I. des Ebisoires 78370 Plaisir France Phone: +33 (1)30-79-15-36 Fax: +33 (1) 30-55-55-37
MIKOM Italia S.r.l. Via Giotto, 2/4 20040 Cambiago Milano Italy Phone: +39 02 95069 11 Fax: +39 02 95069 129	**AT Singapore** 80 Marine Parade Road #19-1 Parkway Parade Singapore 449269 Phone: +65 (345) 8022 Fax: +65 (345) 8033	**AT China** CITIC Building, # 11-04 19 Jianguomenwai Avenue Beijing 100004 China Phone: +86 (10) 6508-3088 Fax: +86 (10)6508-3066
AT Canada 1815 Ironstone Manor, # 12 Pickering, Ontario L1W 3W9 Canada Phone: +1 (905) 839-3474 Fax: +1 (905) 839-4663	**Mikom (UK) Ltd** Guildgate House Pelican Lane Newbury RG14 1NX, Berkshire U.K. Phone: +44 (1635) 569-695 Fax: +44 (1635) 569-463	**AT India** F-1 Adarshini Plaza 93, Adchini SRI Aurobindo Road New Delhi-110017 India Phone: +91 (11) 653-2126 Fax: +91 (11) 653-2120
MIKOM Austria Weglgasse 10 2320 Schwechat Austria Phone: +43 (1) 706 – 3999 Fax: +43 (1) 706 – 39999	**MIKOM Switzerland** Tiergartenweg 1 4710 Balsthal Switzerland Phone: +41 (6238) 61260 Fax: +41 (6238) 61261	**C-COM Czech Republic** U Morusi 888 530 06 Pardubice-Svitkov Czech. Republic Phone: +42 (0406) 301280 Fax: +42 (0406) 301298

table 1-1 List of international sales offices

For your notes

2. INTRODUCTION

2.1. PURPOSE

Cellular telephone systems transmit signals in two directions between base transceiver station (BTS) and mobile stations (MS) within the signal coverage area.

If weak signal transmissions occur within the coverage area because of indoor applications, topological conditions or distance from the transmitter, extension of the transmission range can be achieved by means of an optical distribution system.

Such a system contains an optical master unit (consisting of up to 13 racks) and several remote units. The number of the remote units depends on the hardware and software configuration. The remote units are connected to the master unit with optical links. The optical loss must be less than 6 dB (up to 10 dB with slight degradation).

The master unit is the connection to the BTS. The configuration of a master unit depends on the number of the remote units and the frequency range.

The optical transmission uses WDM-systems with a wavelength of 1550 nm in the uplink and 1310 nm in the downlink.

2.2. THE MMR MASTER UNIT

The fibre optic distribution system is designed for GSM and UMTS services.
Up to 3 bands ((E)GSM, GSM1800 and UMTS) can be transmitted. Each sector will be able to serve up to 4 remote units and to operate services of up to 4 providers in GSM900, GSM1800 and UMTS, each.

An auto-levelling function for compensating different fibre losses and a supervision concept are implemented.

The master unit is the link between BTS and the MMR300/400/2000 remote units connected to the master through optical fibre lines. It is the conversion unit from RF to fibre optic. Supported frequency bands are (E)GSM900, GSM1800 and UMTS. One master unit (consisting of up to 13 racks) can support up to 124 remote units. Point to point connection is obligatory. The master unit controls the complete system and also the auto-levelling function.

For your notes

3. FUNCTIONAL DESCRIPTION

3.1. GENERAL

The MMR master unit comprises two signal chains.

In the uplink direction, the optical signals from the remote units – transmitted via optical fibres – are converted into RF-signals by the transceiver. From there, they are forwarded via a frequency separation unit denominated as duplexer and the 4-way combiner (one for each band) to the connector, which transmits the signals to the BTS.

In the downlink direction, the signals from the BTS are forwarded to the 4-way combiner. After passing through the duplexer, the RF signals are converted into optical signals by the transceiver and finally are transmitted via optical fibres to the remote units.

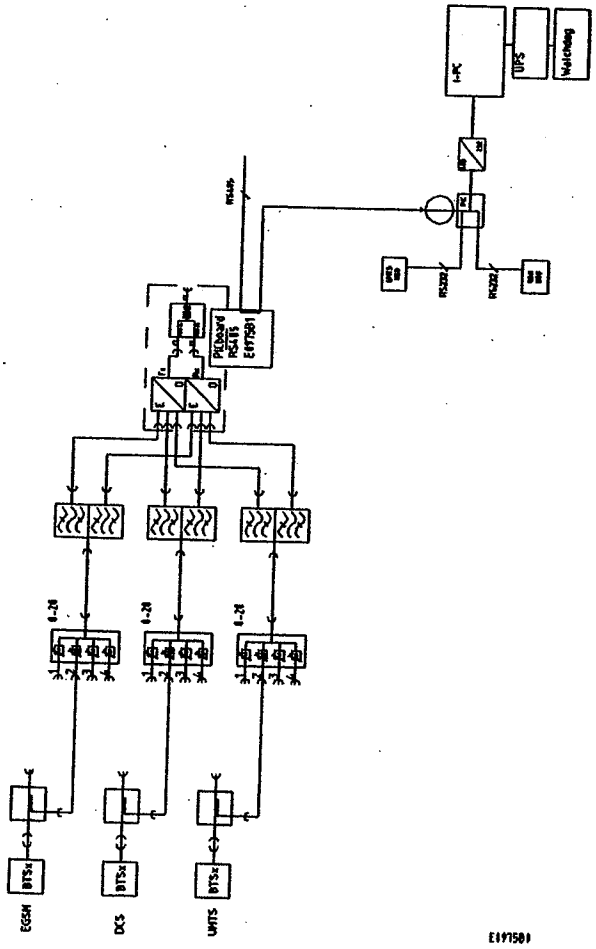


figure 3-1 Block diagram

3.2. COMPONENTS OF THE MASTER UNIT

The actual configuration of the unit can be seen at the configuration list, which is part of the delivery.

The basic sections of a master unit are:

- an optical section consisting of up to ten optical transceivers
- each transceiver is accompanied by a combining section consisting of up to three combiners (one for each band)
- a duplexer section located behind the optical and combining sections (one duplexer is required for each combiner)
- a power supply section
- a control unit consisting of a PC and UPS for supervising the system and alarm forwarding to the OMC

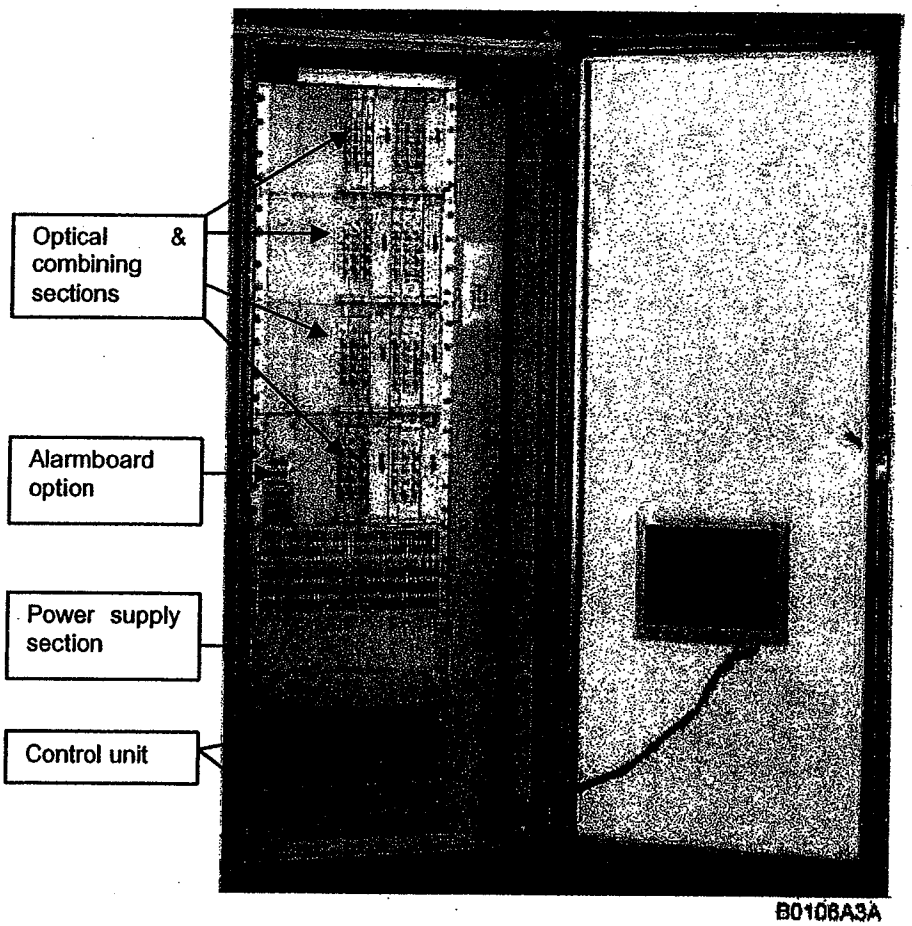


figure 3-2 Components of an optical master unit

3.2.1. Optical and Combining Section

The optical and combining sections are located in the upper five subracks of a master unit. One subrack provides space for up to two optical transceivers, each accompanied by up to three combiners (one for each band). See also chapter *5.2 Commissioning the RF and Optical System (fig. B0097A1A).*

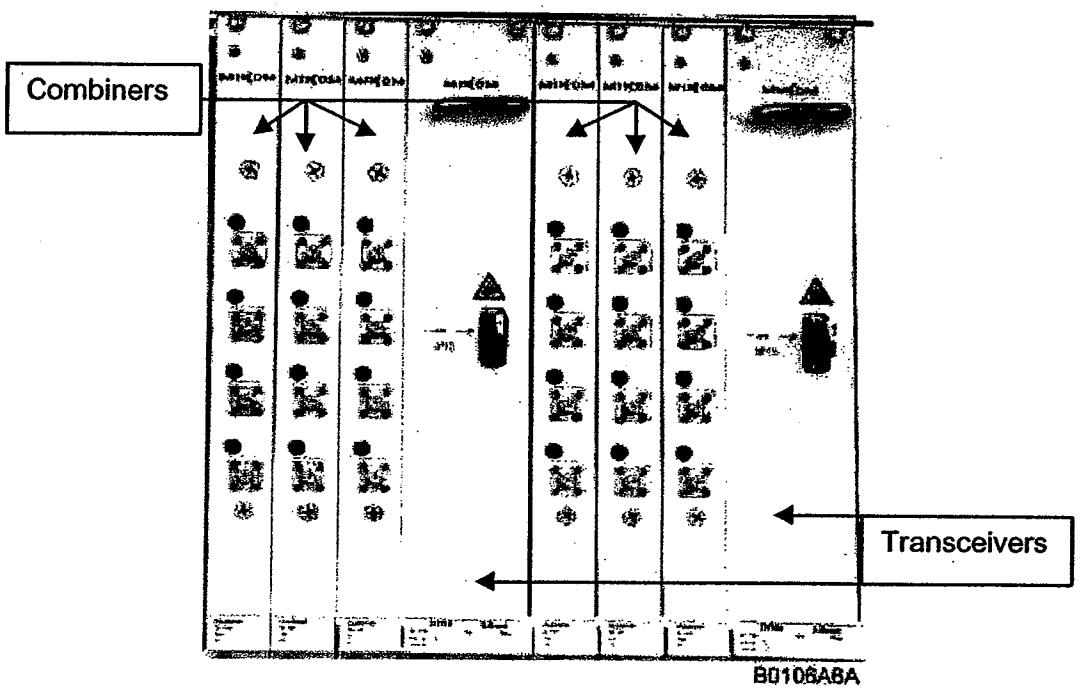


figure 3-3 Optical and combining section

Behind each optical transceiver the UL & DL band ports required for levelling the individual bands are located. Thus, the transceiver has to be removed for the levelling procedure. (See chapter *5.2 Commissioning the RF and Optical System*.)

Attached to each transceiver is a control board for setting the address.

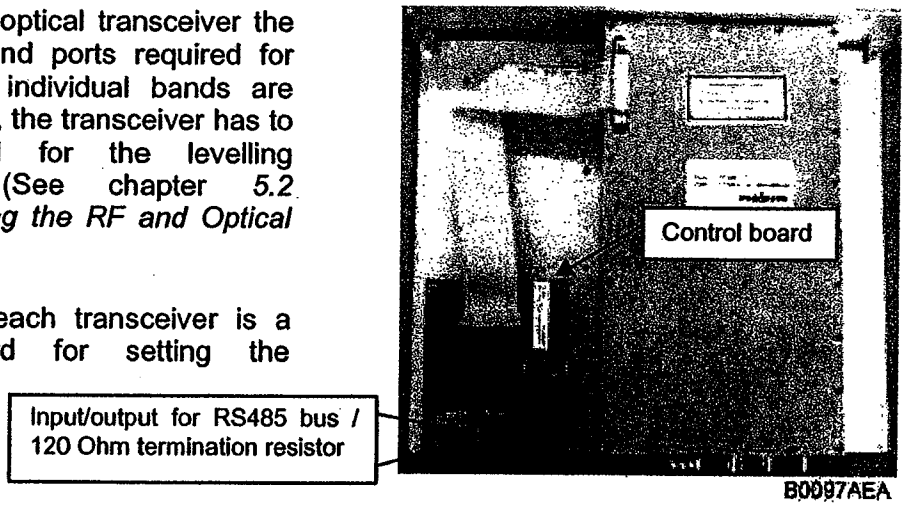


figure 3-4 Transceiver with control board

At the control board all transceivers are connected via an RS485 bus starting at the PC. Please note that this chain must not be interrupted. If one transceiver in the chain is removed the transceivers before and after the removed part must be connected with the RS485 cables to close the gap in the chain. Otherwise, all transceivers after the missing part and the respective remote units will no longer be supervised.

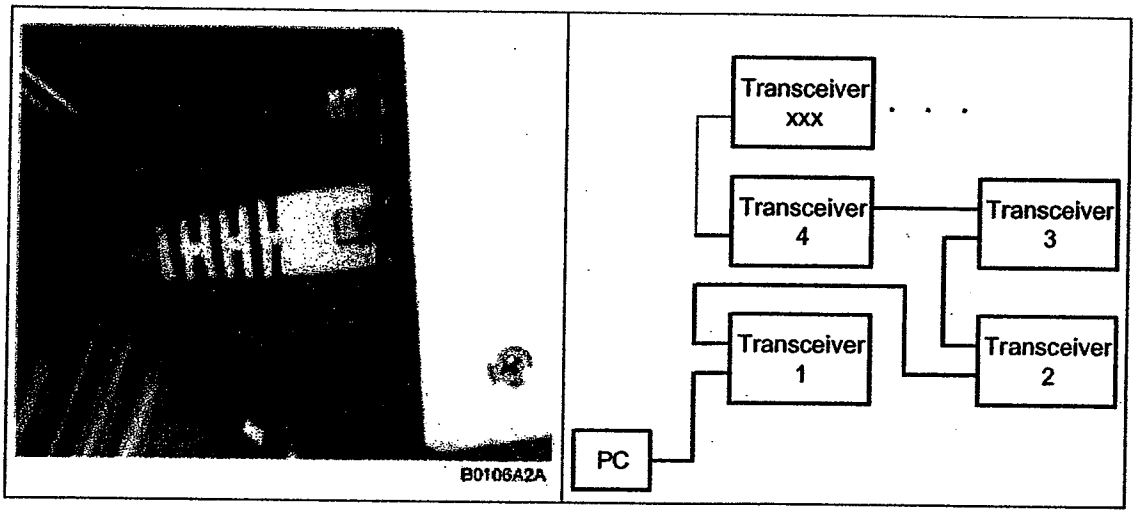


figure 3-5 RS485 bus

3.2.2. Duplexer Unit

Each combiner requires a duplexer to isolate uplink from downlink, i.e. to separate the transmitting path from the receiving path.

The pass bandwidth of the duplexer is the entire width of the UL and DL band of the corresponding network.

The duplexer units are located behind the optical and combining sections

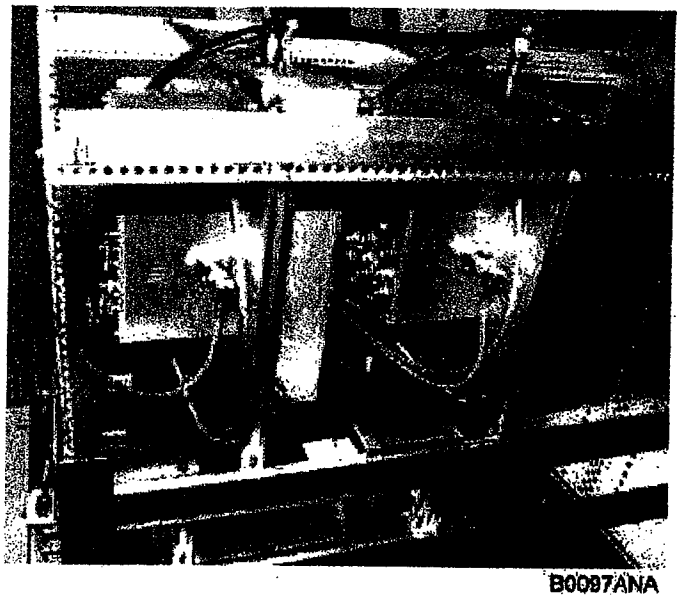


figure 3-6 Duplexer unit, interior view

3.2.3. Control Unit

The first master rack in a system contains the control unit* for controlling the system.

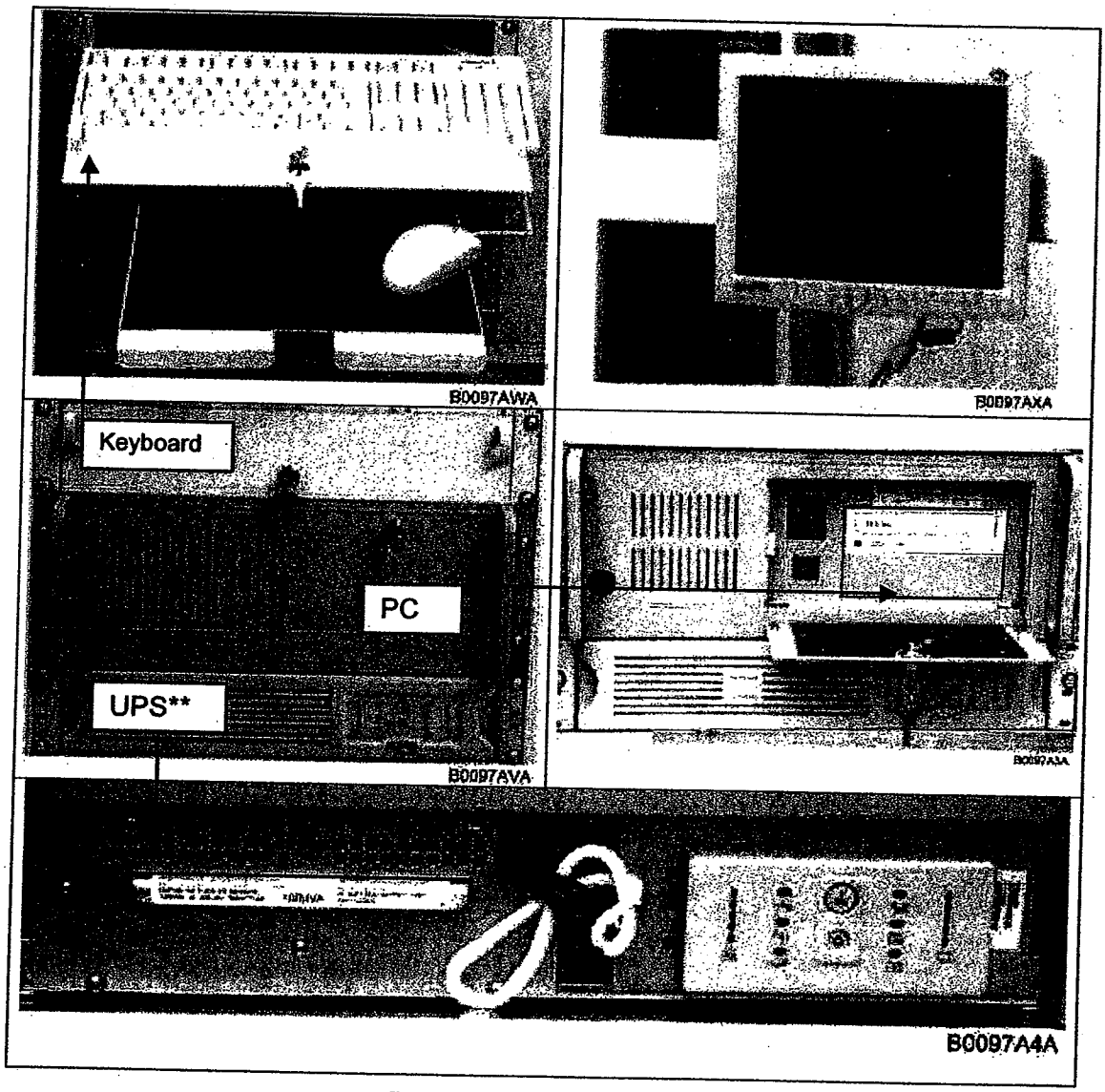


figure 3-7 Control section

* Due to minor design changes this section might look slightly different from the illustrations in this manual, which has no effect on the functionality.

In case of power failure the PC is provided with an uninterruptable power supply. For this unit a separate manual is available.

3.2.4. Power Supply Section

The power supply unit is located at the bottom of the rack or – in case of the first rack in a system – above the control section

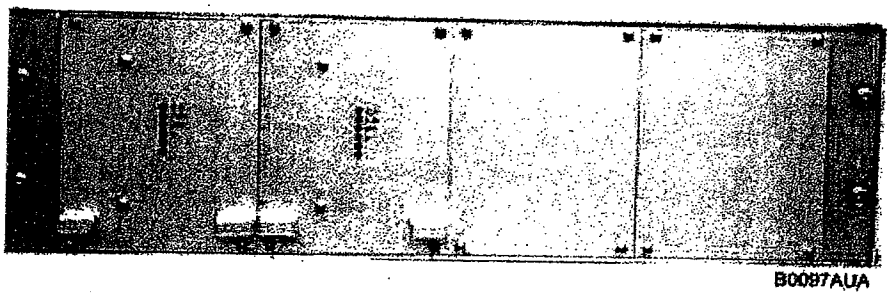


figure 3-8 Power supply section

The switches are accessible by sliding the front aside.

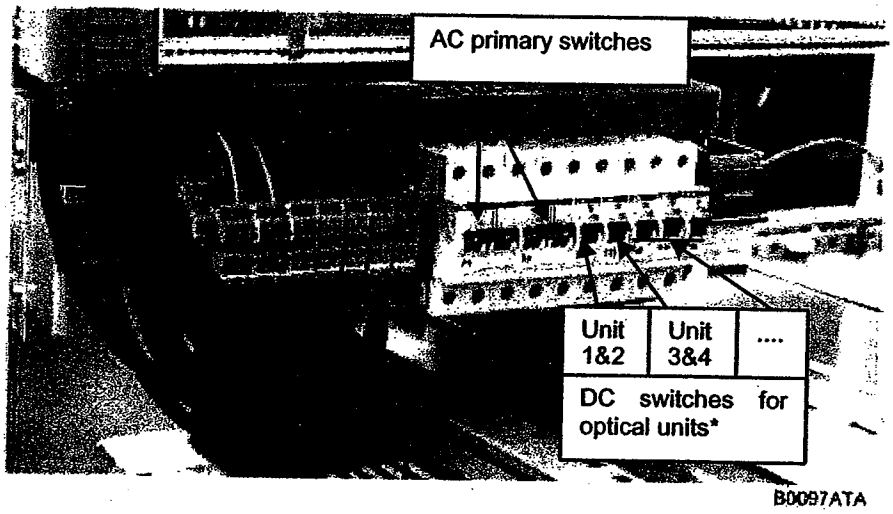


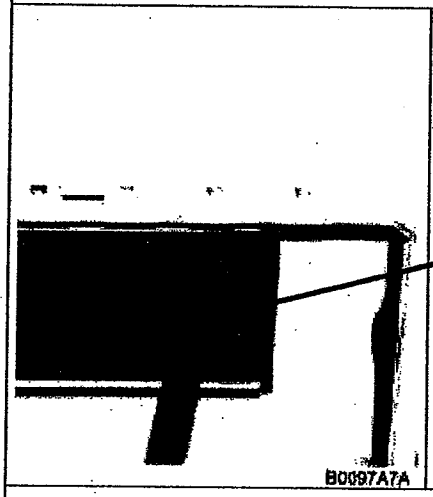
figure 3-9 Power supply switches

* One DC switch serves for two optical units.

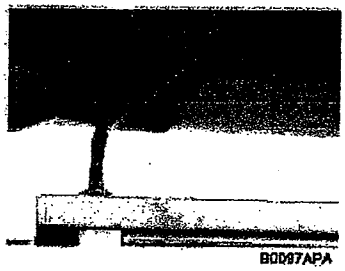
The system is configured in "hot standby" that means there is only one power supply for each rack.

4.2.2. Grounding and Power Connection

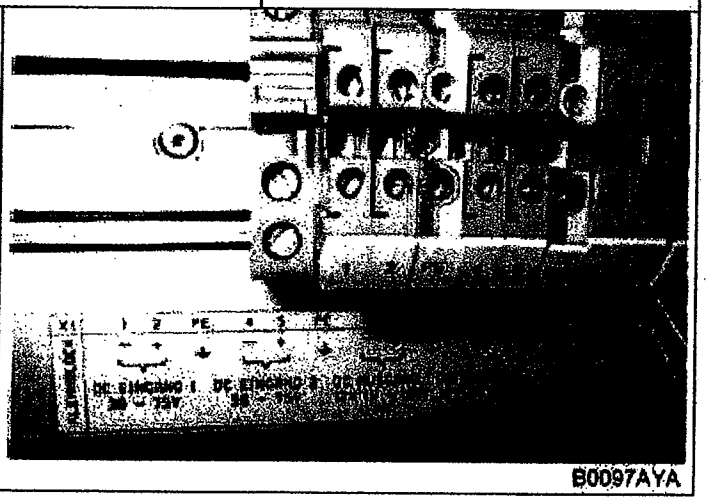
Lead the mains cable through the opening* in the top of the rack into the master unit as shown:



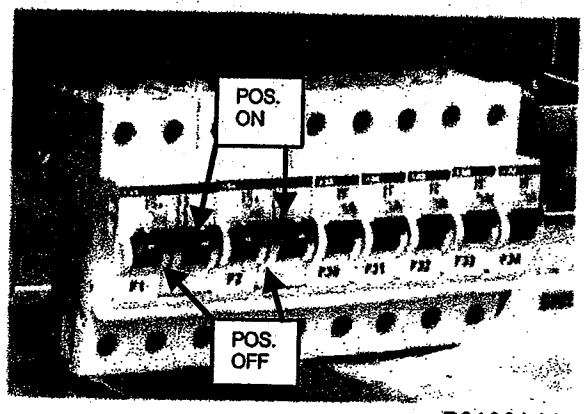
* The antenna cables may also be lead through this opening. In view of different on-site conditions the top can be installed with the opening at the front or at the back. To change the position unscrew the four top screws with an appropriate tool as illustrated, take off the top cover, put it in the required position, and fasten it again with the four screws.



Connect the mains cable wires at the mains terminal (positions 1/2/PE and 4/5/PE) according to the labelling.



In order to switch on the unit, switch the two AC primary switches to position ON.



B0106A1A

figure 4-2 AC primary switches

☛ **Note:** **To ensure safety, the electrical and subsequent installations, commissioning and maintenance activities that require the unit to be under power while open, must only be carried out by suitably qualified personnel.**

4.2.3. Antenna Connections

☛ **Note:** **For mounting the cable connectors, it is recommended to refer to the corresponding documentation of the connector manufacturer. The bending radius of the antenna cables must remain within the given specifications.**

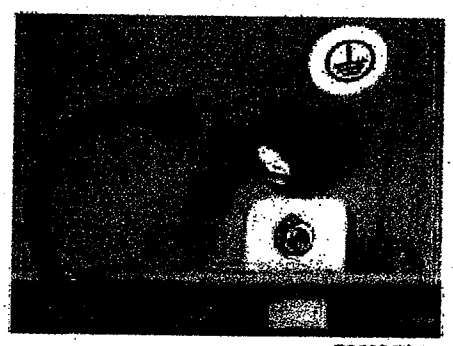
☛ **Note:** **For the selection of cable and antenna it should be considered that a cable with higher loss is less expensive but on the other hand it impairs performance.**

⚠ To tighten the SMA connectors, use an appropriate tool in order not to exceed the specified torque of 100 Ncm. The use of an unsuitable tool may cause damage to the connector and therefore, lead to a malfunctioning of the unit.

If inserting the cables through the top opening – which can be at the front or back as explained in chapter *4.2.2 Grounding and Power Connection* – is difficult because of the on-site conditions they can also be inserted from the bottom by removing one of the bottom panels.

➢ To do so, first disconnect the grounding connector of the respective panel.

➢ Then, loosen the two panel screws and remove the panel.



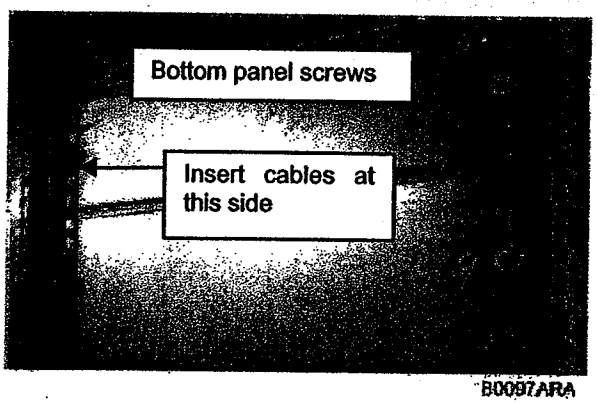


figure 4-3 Removal of bottom panel

➢ It is recommended to insert the cables at the side opposite the grounding connector.

➢ The removed panel does not have to be reinstalled.

4.2.4. Rules for Optical Fibre Cable Connection

Optical signals are transmitted by use of optical fibres. When connecting the fibres according to chapter *5.2 Commissioning the RF and Optical System* observe the following instructions.

☛ **Note:** **Care should be taken when connecting and disconnecting fibre optic cables. Scratches and dust significantly affect system performance and may permanently damage the connector. Always use protective caps on fibre optic connectors not in use.**

In general optical fibres do not need special protective measures. However, protection against environmental influences e.g. rodents and humidity must be considered.

The optical fibre is a single mode fibre. Type is E9/125 with the following minimum requirements.

Attenuation:	<0.36 dB/km @ 1310 nm	/	<0.26 dB/km @ 1550 nm
Dispersion:	<3.5 ps/nm km @ 1310 nm	/	<18.0 ps/nm km @ 1550 nm

The specified bending radius of the optical fibres must not be exceeded. The pigtails for the connection between master unit and remote unit must have a sufficient length. A protection for the feeding into units must be given. The system attenuation of the optical fibres, including the connectors, must not exceed 10 dB. Less than 6 dB is desired for optimum system performance.

System attenuation and attenuation of optical components must be determined. This can be achieved by measuring attenuation and reflection with an appropriate measuring instrument. For pigtails, a total value of < 0.4 dB (measured to a reference plug) can be assumed due to the dead zone of the reflectometer. These measurements must be made with a sufficient length of optical fibre, at the in- and output of the device which has to be measured.

Fibre cable connectors have to be of the same type (E2000APC) as the connectors used for the unit. The fibre optic cables are connected to the optical transceiver.

☛ **Note:** **Angled connectors are not compatible with straight optical connectors; non-compatibility of connectors will result in permanent damage to both connectors.**

Before connecting the fibre cables, follow the procedure below to ensure optimized performance. It is important that these procedures are carried out with care:

- Remove fibre optic protective caps.
- Do not bend the fibre optic cable in a tight radius (< 4 cm) as this may cause cable damage and interrupt transmission.
- Using high-grade alcohol and lint-free cotton cleaning swabs, clean the end of the fibre optic cable that will be inserted in the optical connectors on the donor interface box.
- Blow out the laser receptacle with clean and dry compressed air to remove any particulate matter.
- Connect the fibre optic cables by inserting the cable end into the laser receptacle and aligning the key (on the cable end) with the keyed slot.
- Do not use any index matching gels or fluids of any kind in these connectors. Gels are intended for laboratory use and attract dirt in the field.

5. COMMISSIONING

5.1. GENERAL

Read the health and safety warnings in chapter *1.2 Health and Safety Warnings* as well as the description carefully to avoid mistakes and proceed step by step as described!

- Do not operate the remote units without termination of the antenna connections! The termination can be achieved by connecting the antennas, a dummy load or the 50-Ohm-terminated connection of a measuring instrument.

- In the master unit system, the last transceiver in a chain has to be terminated with the 120 Ohm termination resistor at one of the connectors provided at the transceiver control board (see *figure 3-4 Transceiver with control board*)

- The DL ALC threshold has to be set according to the specifications laid down in the "User's Manual" for the corresponding remote unit.

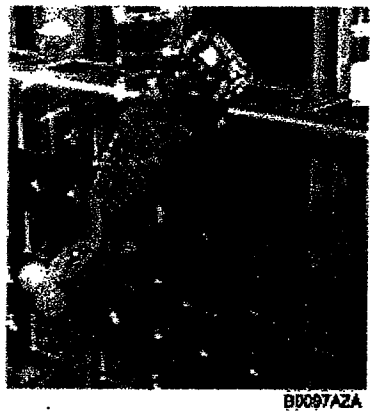
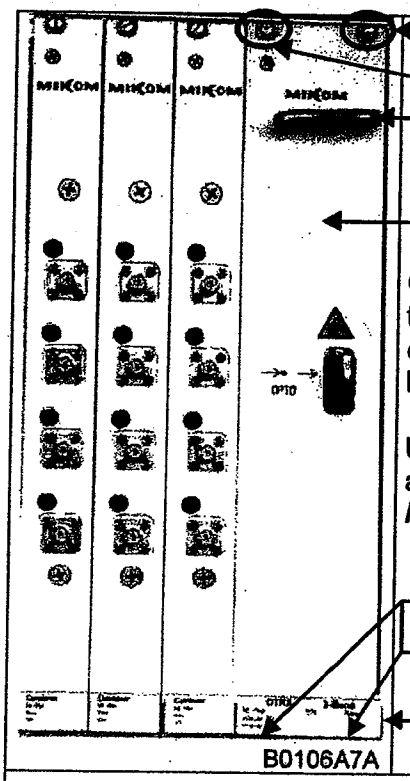


figure 5-1Termination resistor

- To ensure safety, the electrical and subsequent installations, commissioning and maintenance activities that require the unit to be under power while open, must only be carried out by suitably qualified personnel.

- When opening the unit, do not damage the seals on the devices inside the unit. Warranty void if the seals are broken!

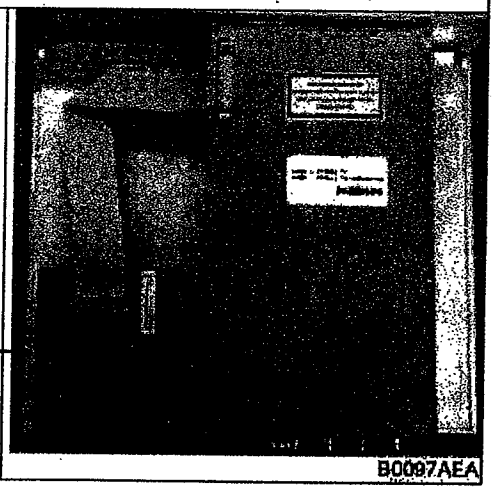
5.2. COMMISSIONING THE RF AND OPTICAL SYSTEM

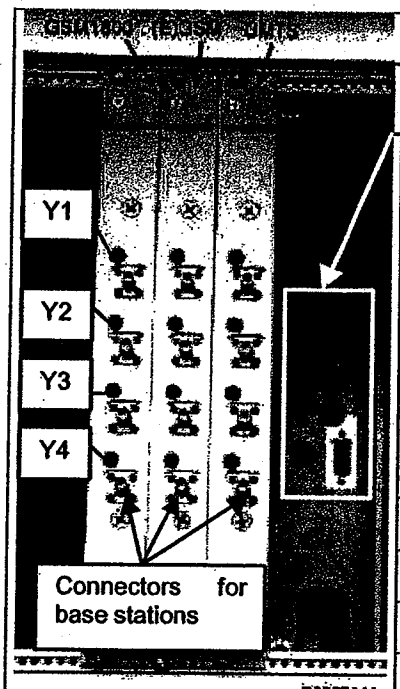


Open the door of the unit and remove the optical transceiver(s) by loosening the four screws by which each transceiver is fastened to the subrack (the two bottom screws are hidden in the picture).

Use the grips to pull the transceiver out of the subrack and disconnect the RS485 cables (see *figure 3-5 RS485 bus*).

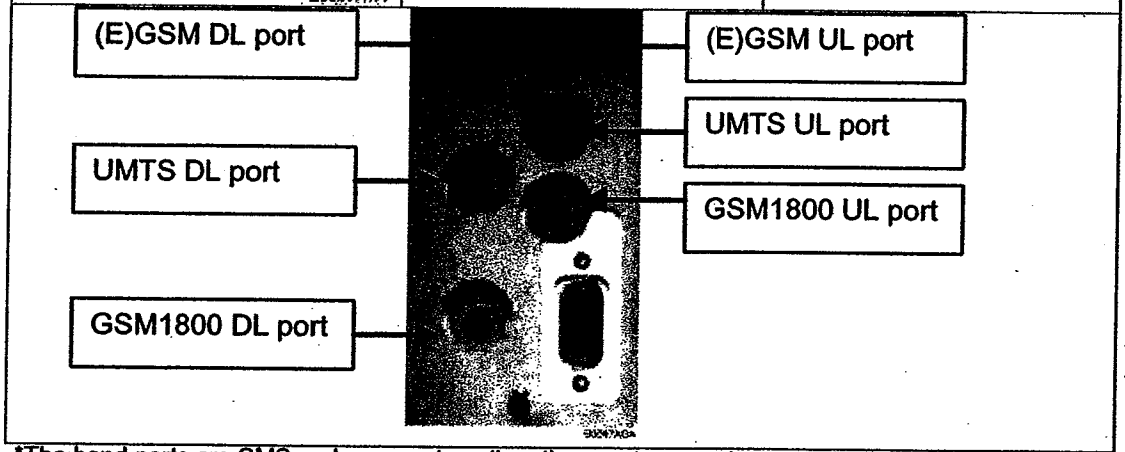
When the transceiver is dismounted, set the DIP switches at the control board as explained in chapter *5.3 DIP Switch Settings*.





- For levelling connect a spectrum analyzer* to the individual band ports (see fig. B0097AGA below).
- Connect the base stations one after the other at the connectors of the respective band combiner and adjust the DL level by means of the corresponding rotary switches y1-y4 until the required level (see below) is reached.

Port	*Required Level*
(E)GSM DL	-2.5 dBm/carrier
UMTS DL	3.5 dBm/carrier**
GSM1800 DL	-2.5 dBm/carrier



*The band ports are SMS male connectors, thus the spectrum analyzer requires SMS female.
** Total performance (all channels → pilot, traffic...)

When all levels (for all 4 base stations of each band) have been adjusted, reconnect the RS485 cables (see *figure 3-5 RS485 bus*), reinstall the optical transceiver, and repeat this step for all other transceivers that are installed.

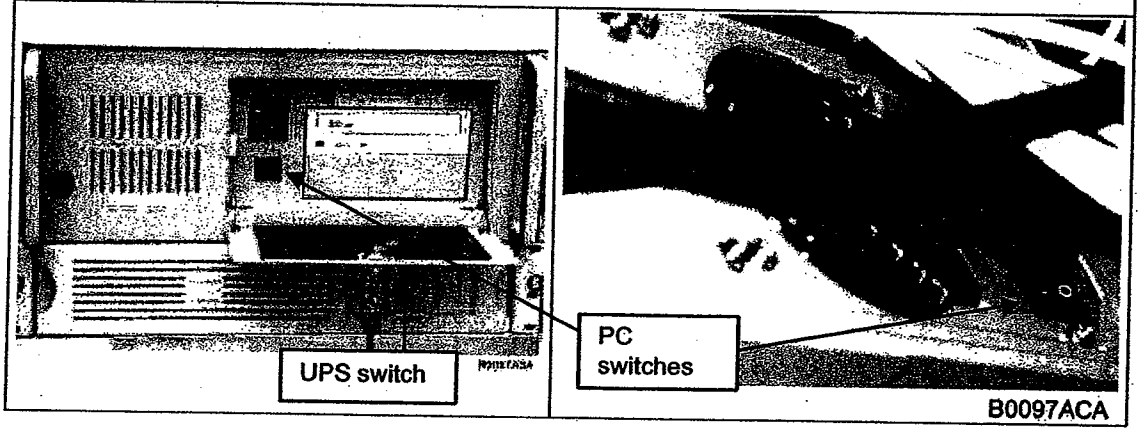
Connect the optical fibres at the fibre connector of the transceivers (see also chapter *4.2.4 Rules for Optical Fibre* Cable Connection).

Switch on the AC primary switches (as described in chapter *4.2.2 Grounding and Power Connection*, fig. B0106A1A).

Then, switch on the DC switches for the installed optical units (see chapter *4.2.2 Grounding and Power Connection*, fig. B0106A1A).

Switch on the UPS.

Switch on the PC (switches at front and backside) and monitor. The program starts automatically and auto-setup and auto-levelling take place.



B0097ACA

5.3. DIP SWITCH SETTINGS

☛ **Note:** **The optical transceivers are numbered from bottom to top, e. g in the first rack* of a system:**

Combiners	Transceiver 7	Combiners	Transceiver 8
Combiners	Transceiver 6	Combiners	Transceiver 5
Combiners	Transceiver 3	Combiners	Transceiver 4
Combiners	Transceiver 2	Combiners	Transceiver 1

* The numbering continues from rack to rack, see also *figure 7-1 Layout of rack.*

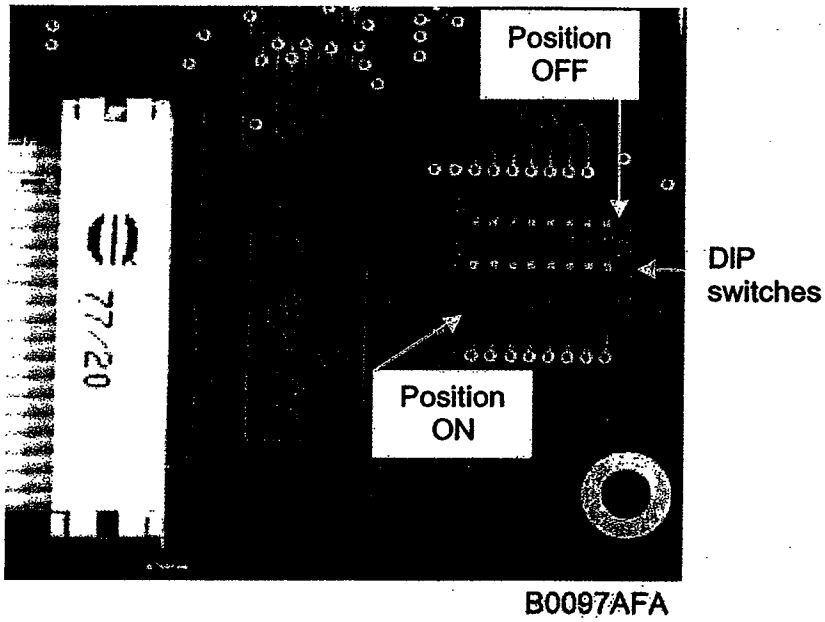


figure 5-2 DIP-switches of control board

DIP-Switch No.:	1	2	3	4	5	6	7	8
Not allowed 0	0	0	0	0	0	0	0	0
Transceiver 1	1	0	0	0	0	0	0	0
Transceiver 2	0	1	0	0	0	0	0	0
Transceiver 3	1	1	0	0	0	0	0	0
Transceiver 4	0	0	1	0	0	0	0	0
Transceivers 5 – 123	Continue according to binary system							
Transceiver 124	0	0	1	1	1	1	1	0
	0 = Position OFF 1 = Position ON							

table 5-1 DIP-switch settings

For your notes

6. CONTROLLING AND PROCESSING SOFTWARE

6.1. GENERAL FUNCTIONS

- Auto-setup (& background auto-setup) of the optical system
- Auto-Levelling of the optical network
- Supervision of the optical network, of all master subrack units, of all remote units and NSO's*.
- Graphic user interface.
- Alarm forwarding via the alarm port (LAN-connection to the OMC server).
- Remote control via the dialogue port (LAN-connection to the OMC server).
- Logging of all errors, alarms, additional information, and tables required by the user interface.

* option

6.2. DESCRIPTION OF THE GRAPHIC USER INTERFACE

The following pull-down menus are available:

File – Connections – Auto-Functions – Add to logfile – Commands – Options – Version Info
These menus are explained in detail in chapter *6.3 The Pull-Down-Menus.*

A movable toolbar is provided, as well. It contains buttons for important functions.

6.3. THE PULL-DOWN-MENUS

6.3.1. File

Open – Open New – Save – Save as – Print log-file – Start DOWNLOAD-Process – Exit .

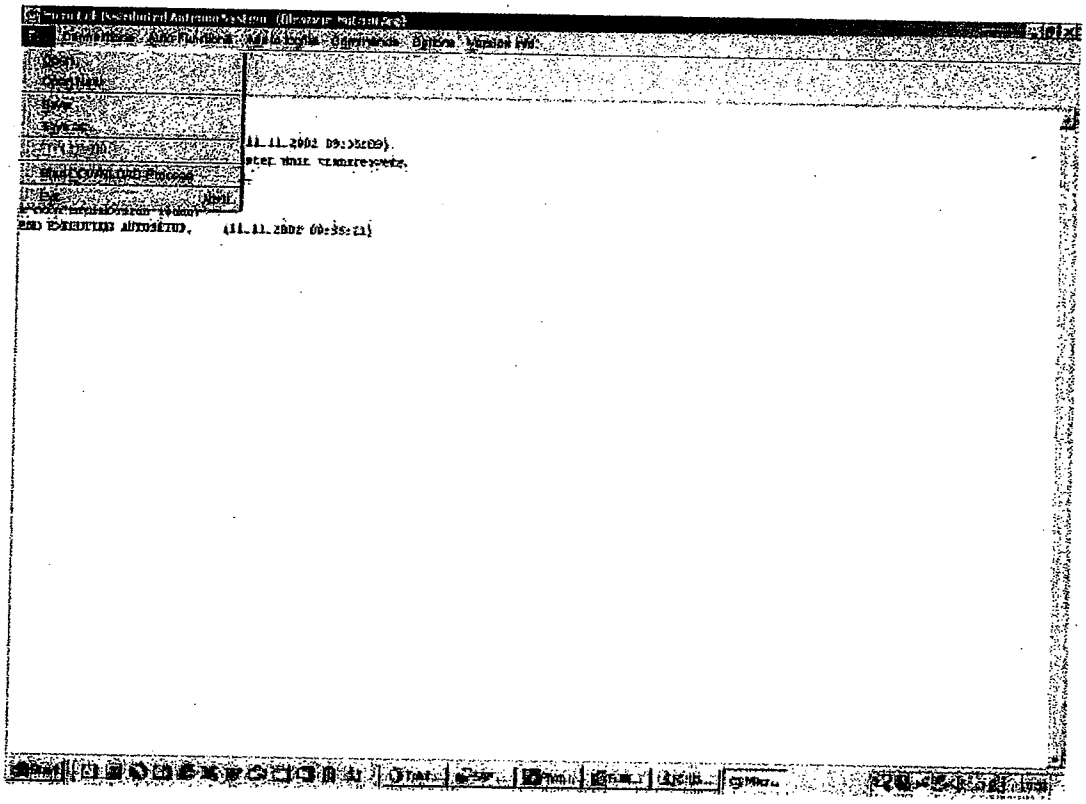


figure 6-1 File menu

All of these menu commands (except the last two, i.e. "Start DOWNLOAD-Process" and "Exit") refer to the log file.

The log data comprise the last 250000 characters (approx. 100 printed pages) of the log process (errors, alarms, additional information, and tables required by the user interface). They also contain date and time.

With "Open" an old log file can be viewed and continued.

With "Open New" the log window is cleared.

With the "Save as ..." or "Save" command the log data can be stored as log file.

"Print log-file" can only be selected if printer driver and printer are existent. (Before choosing this command the "startPara.prop"-file has to be changed as follows: printer=yes.)

"Start DOWNLOAD-Process" opens the Download dialogue, where the download process can be started and monitored. The procedure is as follows:

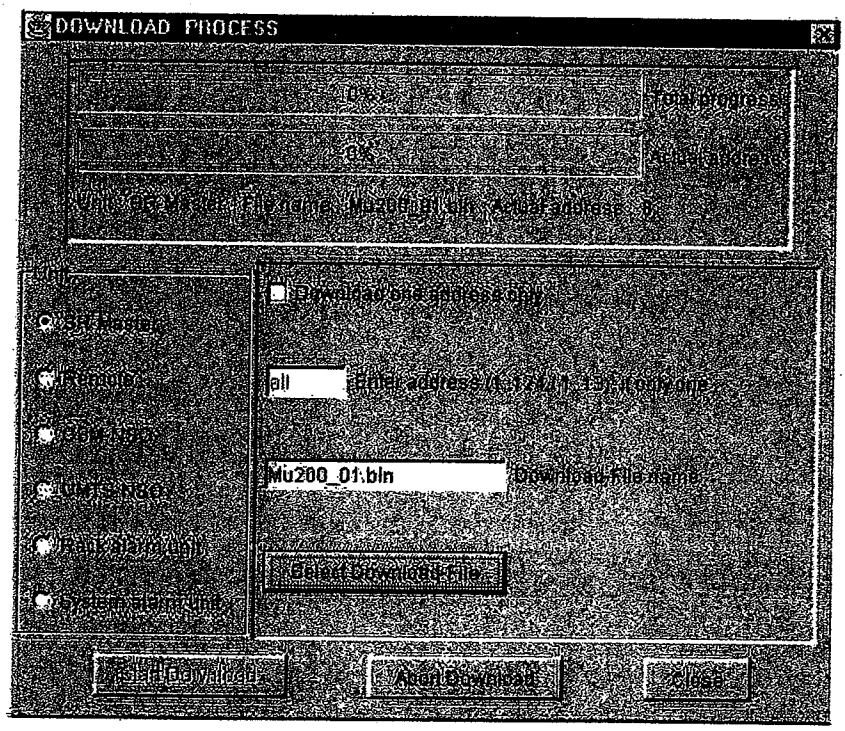


figure 6-2 Download process

- Select the unit (Master, Remote, GSM-NSO*, or UMTS-NSO*)
- If "Download one address only" is selected, the address of the unit has to be entered.
- Choose "Select the Download-File" and select the file (in the new window that opens).
- Choose "Start Download".
- "Total progress" and "Actual address" are monitored.
- Choose "Close".

→ The download is working in the background and does not affect any other functions except the manual "Auto-Setup", which is locked while downloading is taking place.

→ By opening the Download dialogue during the download the "Total progress" and the progress of the "Actual address" can be monitored or "Abort Download" can be chosen.

* only available if option is active

"Exit" ends the whole program and saves the log data in the file "last.log".

6.3.2. Connections

Open System Port – Close System Port – Select System Port

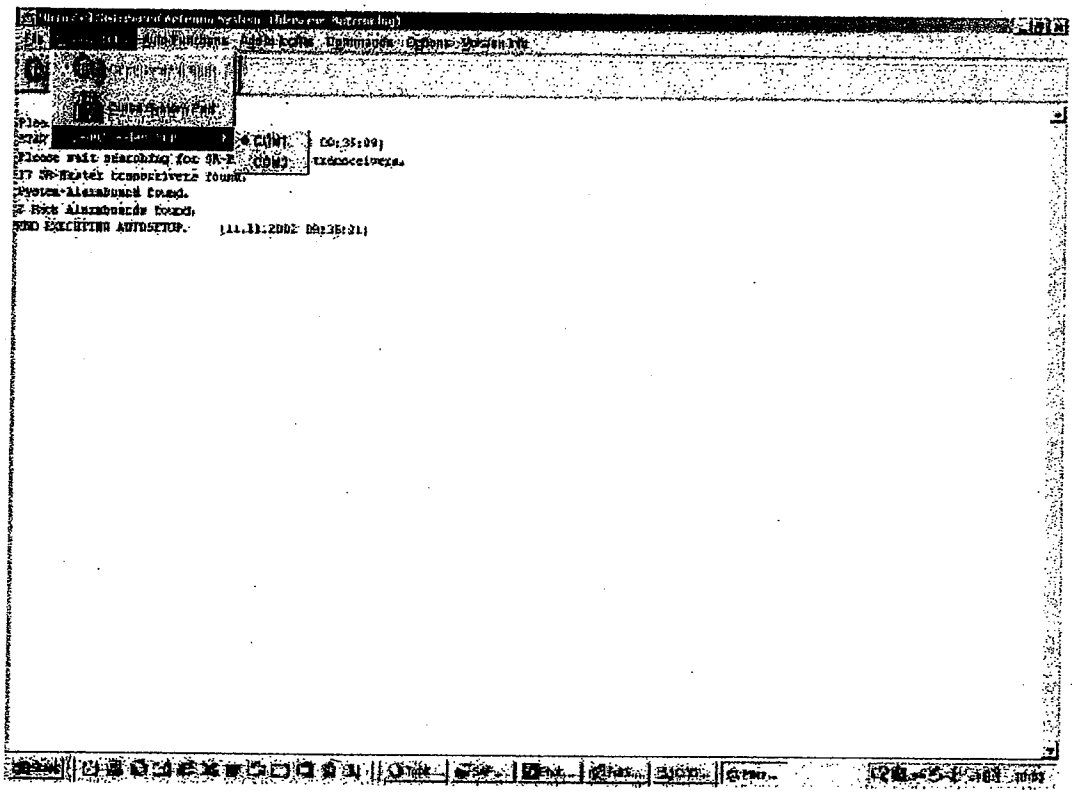


figure 6-3 Connections menu

The System Port is the serial interface (RS232 / RS485) to the system (master subrack units, remote units and NSO's*). This port serves to control the hardware.

* option

6.3.3. Auto-Functions

Execute Auto-Setup – Start Auto-Polling – Stop Auto-Polling – Full Polling – Only Auto-Levelling – Without Auto-Levelling (one of the last 3 items can be selected) – Change Auto-Levelling Priority – Change Auto-Setup Priority – Load Attenuator Data – Reset All SR-Master Attenuators – Reset All Remote Attenuators .

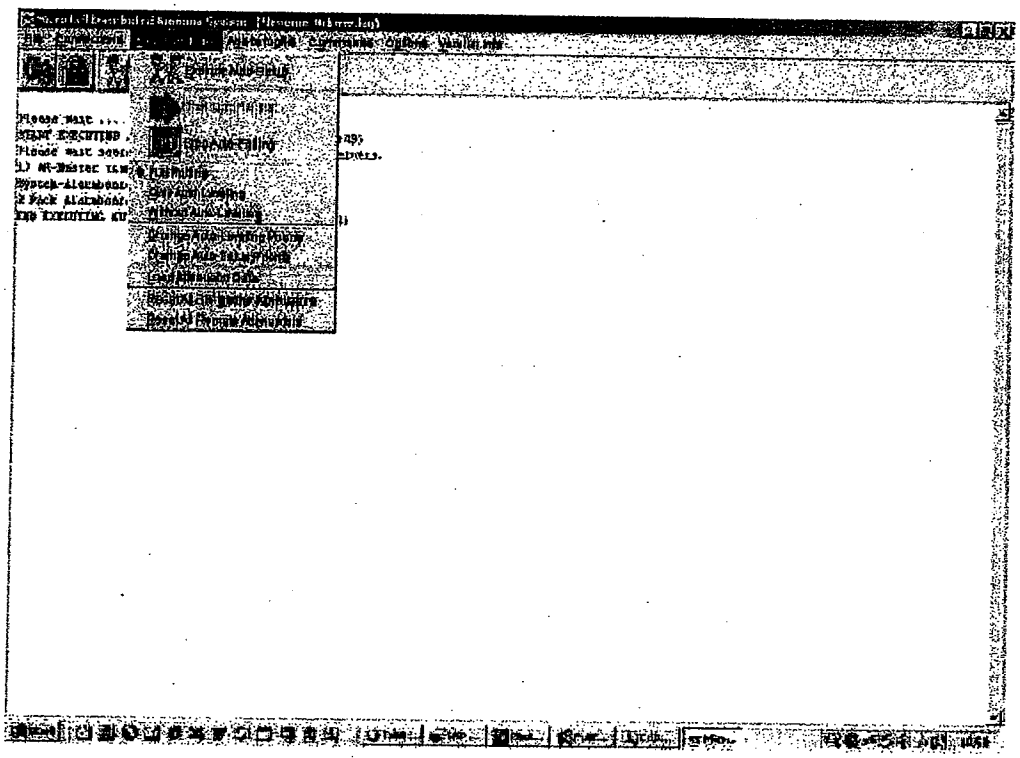


figure 6-4 Auto Functions menu

"Execute Auto-Setup" searches the system for existing hardware addresses. „Auto-Setup" has to be started when a master-subrack + remote + ... were added or removed or exchanged, or after changing an address.

"Start Auto-Polling" starts the supervision and control of the system, and "Stop Auto-Polling" ends it. There are three types of functions :
– Full Polling – Only Auto-Levelling – Without Auto-Levelling.
The first is standard, the other two are for test purposes.

With "Change Auto-Levelling Priority" the frequency of the Auto-Levelling function can be set. The standard value of the counter is 100, i. e. after every 100th query of an address status, the Auto-Levelling function is carried out for this address.
(→ For the query approx. 0.3s are required per address, i.e. in case of 10 addresses autolevelling takes place every 5 minutes.)

With "Change Auto-Setup Priority" the frequency of the background autosetup can be set. The standard value of the counter is 100, i.e. a defect unit is not queried 100 times in the polling process before another try to resume the unit is made. Every resumed unit is reported as an alarm and a message is written into the logfile.

Remark: A unit (Master, Remote, GSM-NSO* or UMTS-NSO*) is declared defect, if it fails to respond repeatedly during alarm polling. The number of consecutive response failures before a unit is declared defect is as follows: Master→2, Remote→5, GSM-NSO*→3 or UMTS-NSO*→3.
* option

With "Load Attenuator Data" the attenuator data from the "attenuat.dat" file are updated. These data are required for the Auto-Levelling function. This menu command must be chosen after the „attenuat.dat" file was exchanged.

With "Reset All SR-Master Attenuators" or "Reset All Remote Attenuators" all master-subrack or all remote attenuators can be set to the maximum value. However, this must be confirmed afterwards in an "Attention" dialogue.

6.3.4. Add To Logfile

Show Addresses – Show Uplink Power Table – Show Downlink Power Table – Show Uplink Attenuators – Show Downlink Attenuators – Show SR-Master active Alarms – Show Remote active Alarms – Show IPP active Alarms – Show Alarmboards status – Show GSM-NSO Cell-Data* – Show UMTS-NSO Cell-Data*.

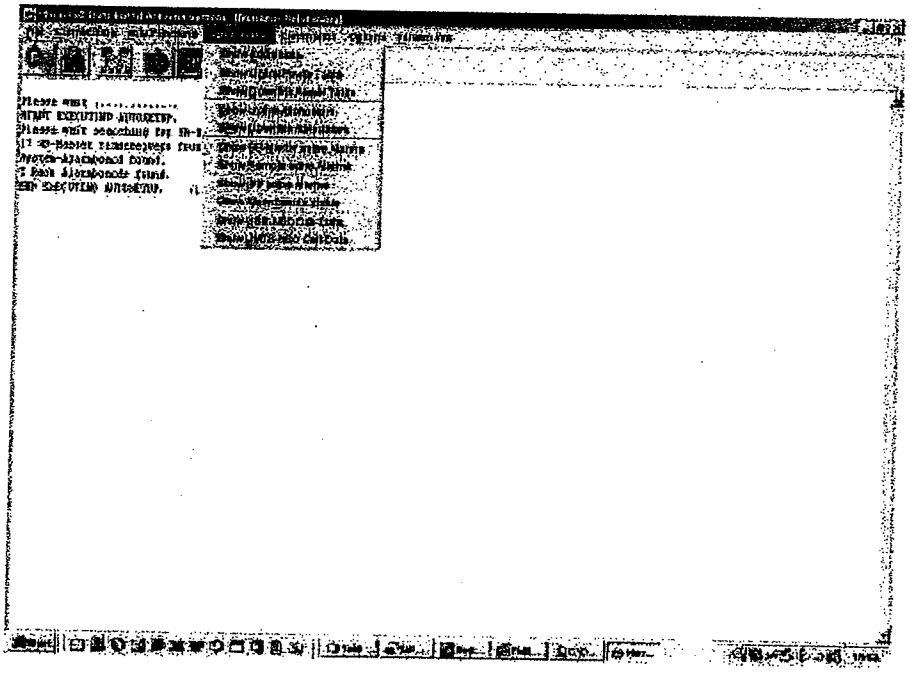


figure 6-5 Add to logfile menu

* only active if the option is installed

With "Show Addresses" at first all addresses administered by the system are displayed. Then, the defect addresses are listed separately for each unit type (Master, Remote, GSM-NSO* or UMTS-NSO*).

With "Show Uplink Power Table" a table with max 124 rows (addresses) and 3 columns is written to the log data. The columns are Transmitter-Remote-Power-detection , Receiver-Master-Power-detection and the optical loss.

With "Show Downlink Power Table" a table with max 124 rows (addresses) and 3 columns is written to the log data. The columns are Transmitter- Master-Power-detection , Receiver-Remote-Power-detection and the optical loss.

With "Show Uplink Attenuators" a table with max 124 rows (addresses) and 6 columns (attenuator settings) is written to the log data. The columns are Transmitter-Remote-UMTS, Receiver-Master-UMTS, Transmitter-Remote-DCS , Receiver-Master-DCS, Transmitter-Remote-GSM and Receiver-Master-GSM.

With "Show Downlink Attenuators" a table with max 124 rows (addresses) and 6 columns (attenuator settings) is written to the log data. The columns are Transmitter-Master-UMTS, Receiver-Remote-UMTS, Transmitter-Master-DCS , Receiver-Remote-DCS, Transmitter-Master-GSM and Receiver-Remote-GSM.

With "Show SR-Master active Alarms" all active alarms for each master-subrack unit are written to the log data. The following errors can occur: I²C-bus, no RU, current UL, optic UL, current DL, optic DL.

With "Show Remote active Alarms" all active alarms for each remote unit are written to the log data. The following errors can occur: door, I²C-bus, fan, temperature, 12V, 26V, no RU, ALC-GSM-UL, ALC-DCS-UL, ALC-UMTS-UL, current UL, optic UL, ALC-GSM-DL, ALC-DCS-DL, ALC-UMTS-DL, current DL, optic DL, Amp-GSM, Amp-DCS, Amp-UMTS, Ext. 4, Ext. 3, Ext.2, Ext.1.

With "Show IPP active Alarms" all active alarms of the input power protection modules are written to the log data. An IPP alarm contains the following information: unit address, band module, input port, and ARFCN.

With "Show Alarmboards status" all active alarms of the system alarmboard and the rack alarmboards are written to the log data.

With "Show GSM-NSO Cell-Data" and "Show UMTS-NSO Cell-Data" all the cell data for each alarm of the respective NSO* are written to the log data.

* only available if the option is installed

6.3.5. Commands

GSM-NSO Commands* – UMTS-NSO Commands* – Get Optical Power – Set/Get RU's External Outputs – Set/Get MU External Outputs – Set/Get Attenuators – Set/Get ALC Threshold – Set/Get Gain Offset – Set/Get FSK Dynamic– Set/Get Desired Ampl. Temperature – Get Temperatures – Get Amplifiers Output Power – Set/Get Amplifier On-Off – Set All OFF, Emergency Stop".

* only active if the option is installed

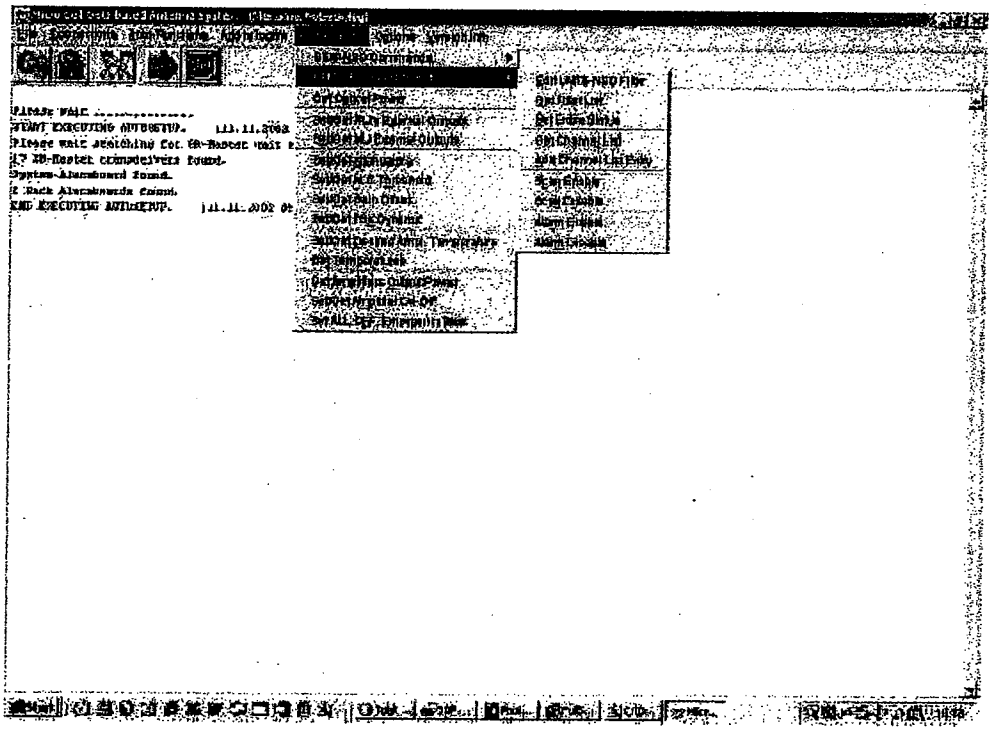
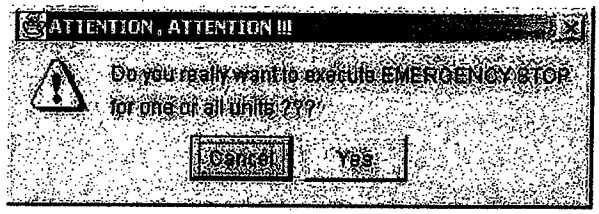


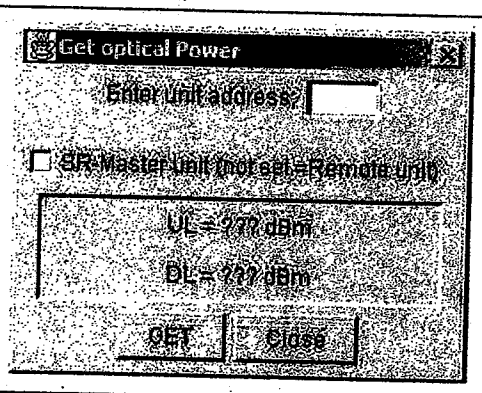
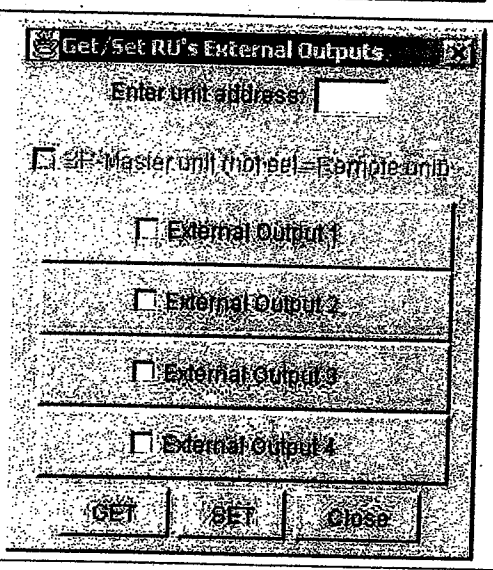
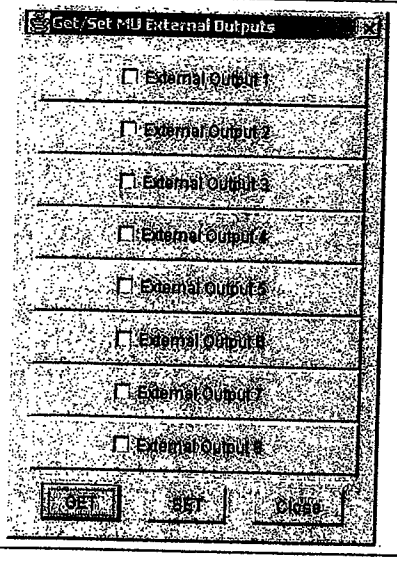
figure 6-6 Commands menu

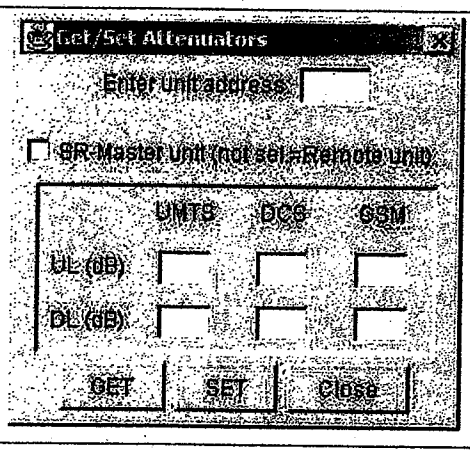
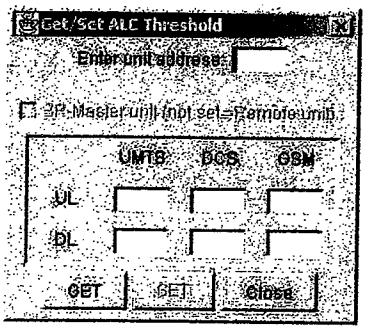
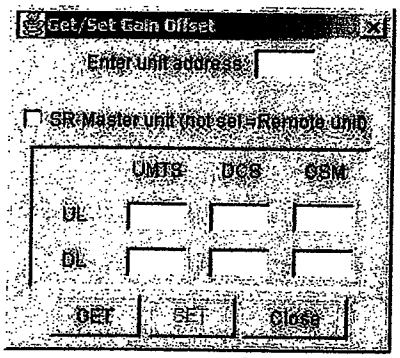
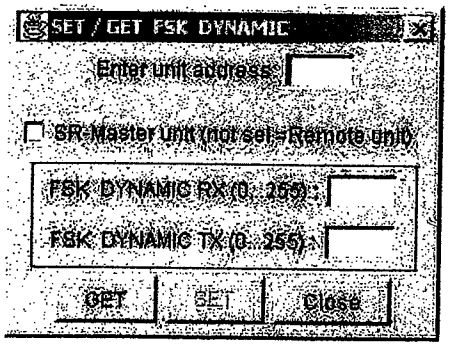
By choosing the last command in the menu ("SET ALL OFF, Emergency Stop"), an "Attention" dialogue is displayed. If it is confirmed, a dialogue for entering the unit address is displayed. Only if this dialogue is confirmed as well, the corresponding unit is irrevocably switched off (Emergency Stop). If address 255 (broadcast) is used, all units are switched off.

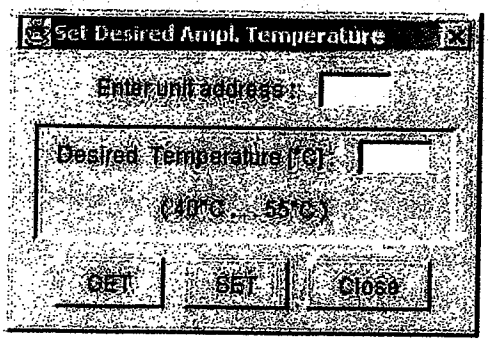
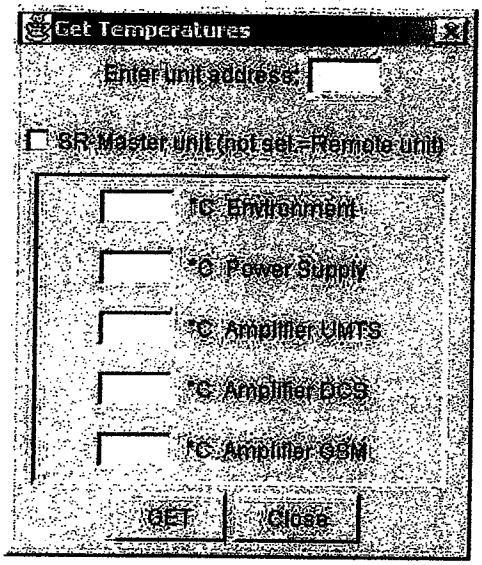
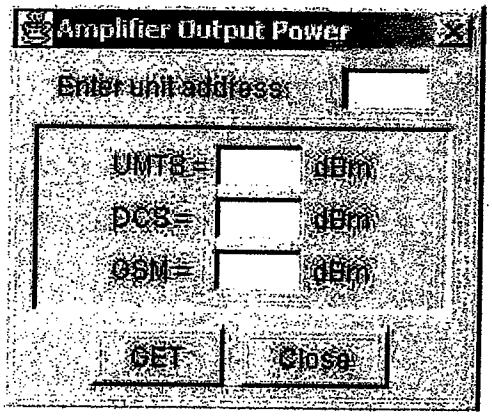


All other menu commands open a dialogue window for setting or reading the corresponding parameters.

6.3.5.1. General Commands

"Get Optical Power": The current values of the UL and DL power detectors for a master-subrack unit or remote unit are displayed.	
"Set/Get RU's External Outputs": The status of four external outputs of a remote unit are displayed (GET-button). This status can be changed (SET button).	
"Set/Get MU's External Outputs": The status of eight external outputs of a master unit are displayed (GET-button). This status can be changed (SET button). These external outputs are provided with the optional alarmboard.	

"Set/Get Attenuators": The current values of the UL and DL attenuators for UMTS, GSM1800 and (E)GSM of a master subrack unit or remote unit are displayed. These values can be changed (SET button).	
"Set/Get ALC Threshold": The UL and DL ALC threshold values for UMTS, GSM1800 and (E)GSM of a remote unit are displayed. These values can be changed (SET button).	
"Set/Get Gain Offset": The UL and DL Gain Offset for UMTS, GSM1800 and (E)GSM of a master subrack unit or remote unit are displayed.	
"Set/Get FSK Dynamic": The Rx and Tx FSK Dynamics for a master subrack unit or a remote unit are displayed.	

"Set/Get Desired Ampl. Temperature": The temperature that is to be maintained for the remote unit amplifier can be set (SET button = write, GET button = read). The fan will regulate its rotational speed so that the set temperature is maintained.	
"Get Temperatures": Five temperatures of a remote unit are displayed (Environment, Power Supply, Amplifier UMTS, Amplifier GSM1800, Amplifier (E)GSM).	
"Get Amplifiers Output Power": Three amplifier output powers (UMTS, DCS and GSM) of a remote unit are displayed.	

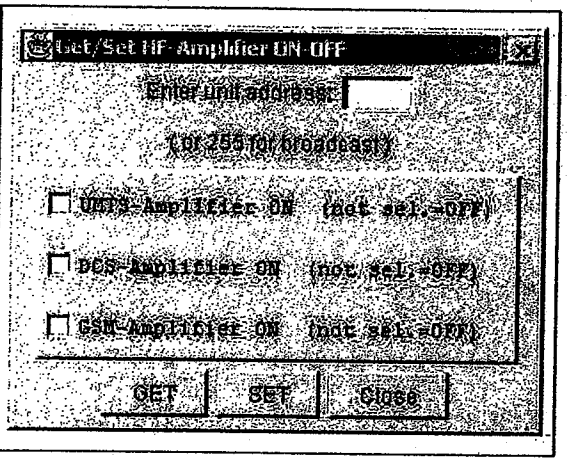
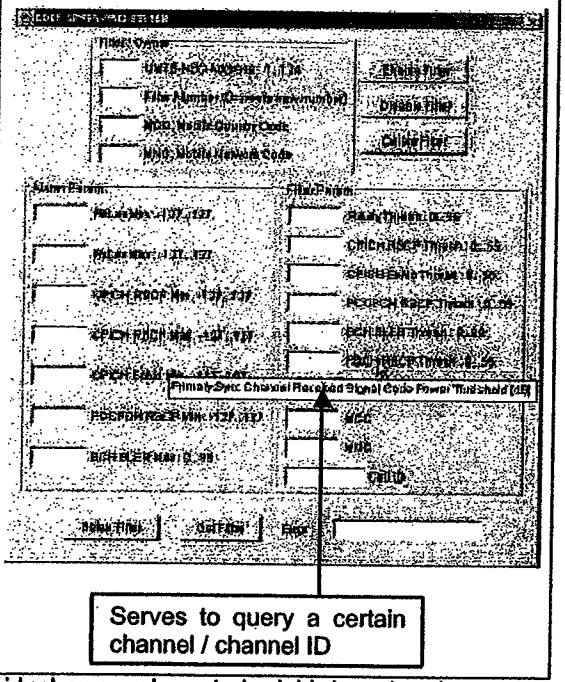
"Set/Get Amplifier On-Off": The ON/OFF status of the three amplifiers (UMTS, GSM1800, (E)GSM) of a remote unit are displayed (GET button). This ON/OFF status can be changed (SET button). If address 255 (broadcast) is entered, the SET command is valid for all units.	

table 6-1 Set/Get commands

6.3.5.2. Optional Commands

"Edit UMTS-NSO Filter": Every owner (identified by MCC* and MNC*) can define up to 20 filters for each remote unit, by setting the desired values in the alarm and filter parameters. Note: By choosing filter number 0, the system will assign the lowest number available (i.e. if filters 1-3 are already defined the system will continue with 4). If an explicit number is entered, the system will assign this number. If a filter with this number already exists, it will be overwritten.	

* The Mobile Country & Network Codes of the individual owners have to be laid down in advance by the system owner using the "Add Channel List Entry" command (see end of this table).

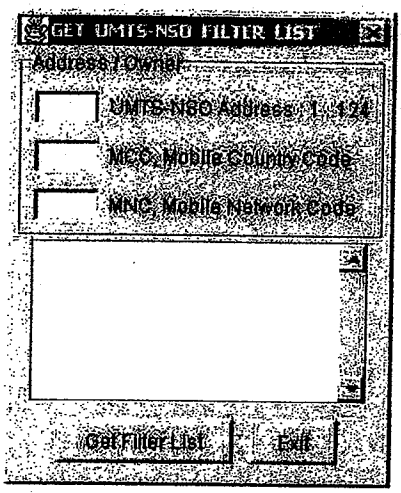
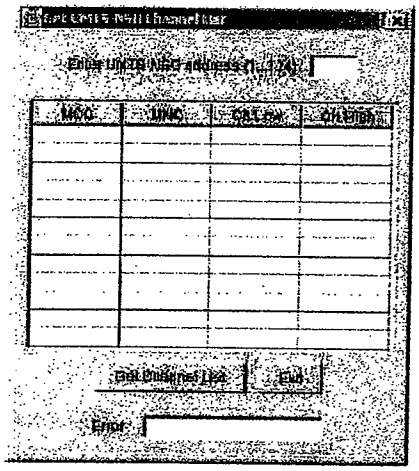
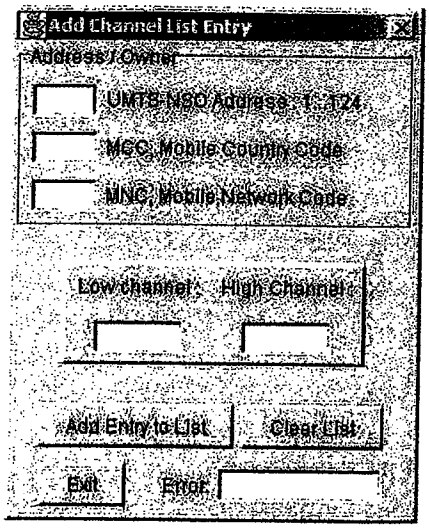
"Get UMTS-NSO Filter List": A list of all filter numbers assigned for the chosen remote unit (address 1 – 124) by the owner identified through MCC & MNC is displayed.	
"Get UMTS-NSO Channel List": This command serves to query the channels set for the individual owner IDs (MCC & MCN) of an address (remote unit). The list shows all data set via the "Add Channel List Entry" command.	
"Add Channel List Entry": The channels for the individual owners – to be identified by their MCC (mobile country code) & MNC (mobile network code), which are also defined by this command – must be set. These parameters are set by the system owner and can be queried with "Get UMTS-NSO Channel List".	

table 6-2 UMTS-NSO Commands

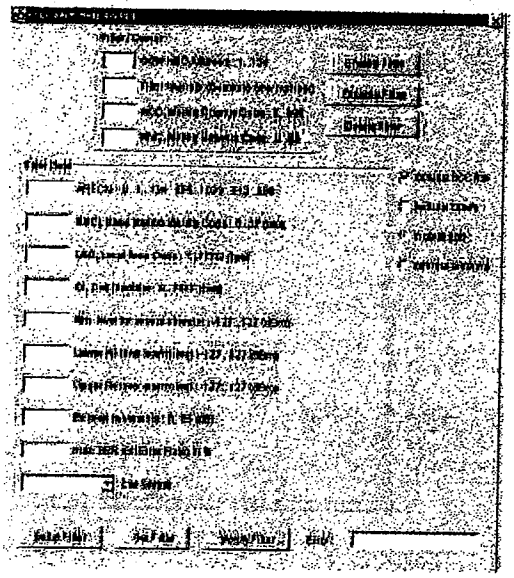
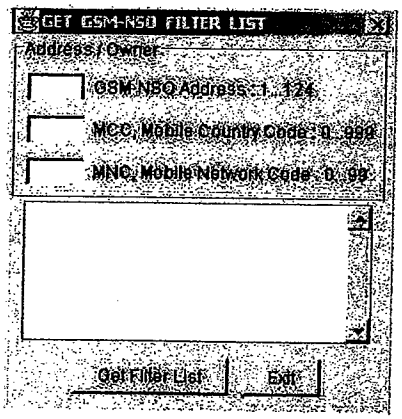
"Edit GSM-NSO Filter": Every owner (identified by MCC and MNC) can define up to 20 filters for each remote unit, by setting the desired values in the alarm and filter parameters. Note: By choosing filter number 0, the system will assign the lowest number available (i.e. if filters 1-3 are already defined the system will continue with 4). If an explicit number is entered, the system will assign this number. If a filter with this number already exists, it will be overwritten.	
"Get GSM-NSO Filter List": A list of all filter numbers assigned for the chosen remote unit (address 1 – 124) by the owner identified through MCC & MNC is displayed.	

table 6-3 GSM-NSO Commands

6.3.6. Options

Java Look and Feel – Motif Look and Feel – Windows Style Look and Feel – Macintosh Look and Feel – Java Look and Feel Big .

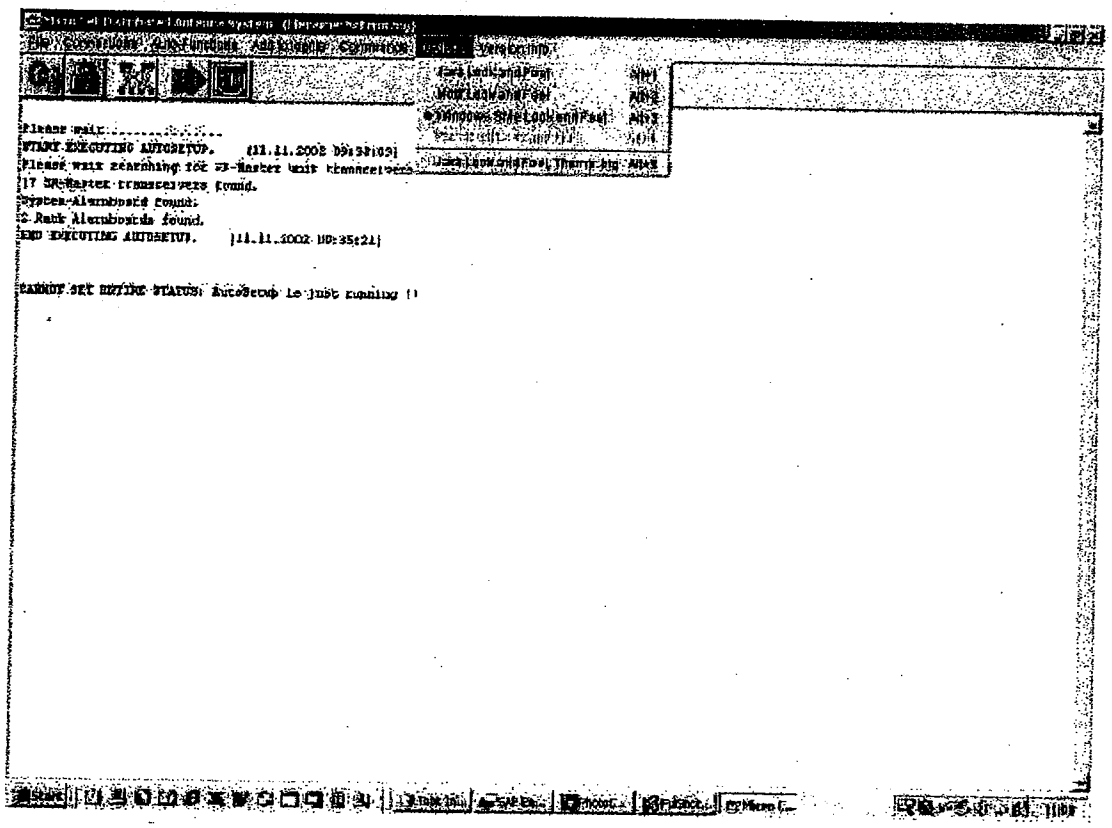


figure 6-7 Options menu

With these options the "Look and Feel" of the whole program can be changed at runtime. The "Look and Feel" of different operating systems is simulated. Also, the design of the dialogues (e. g. Open, Save, ...) is adapted accordingly.

6.3.7. Version Info

This Software – Hardware Info – Software Info

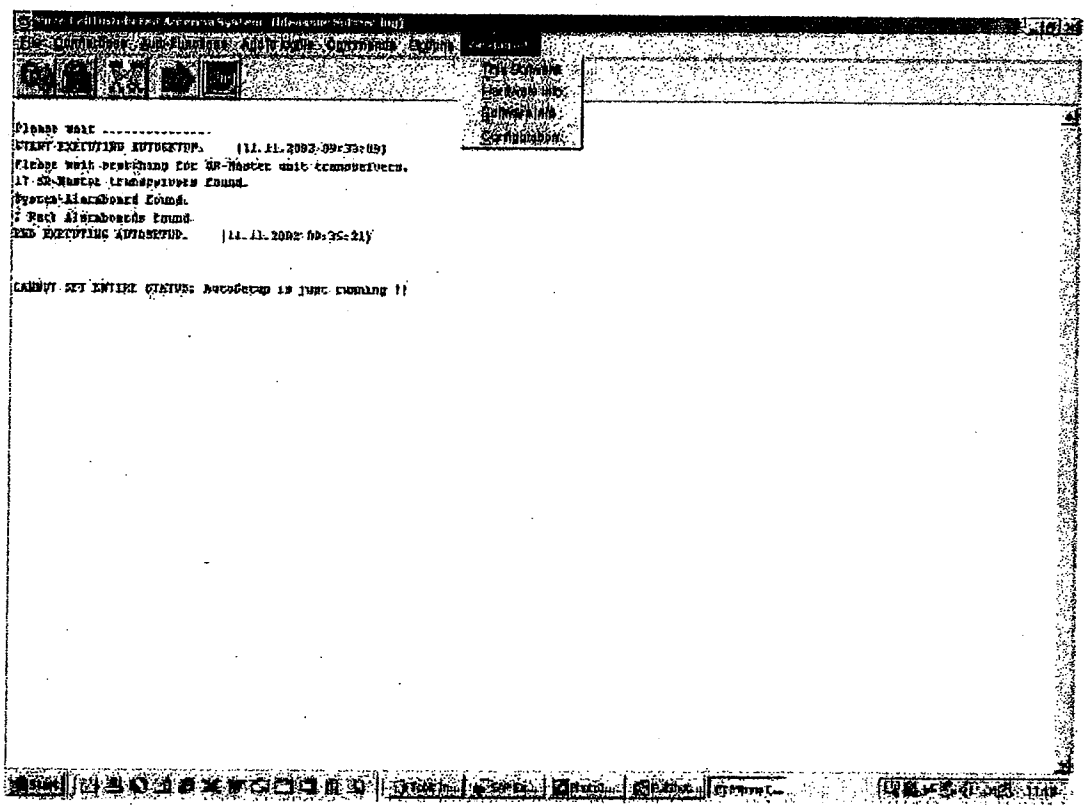
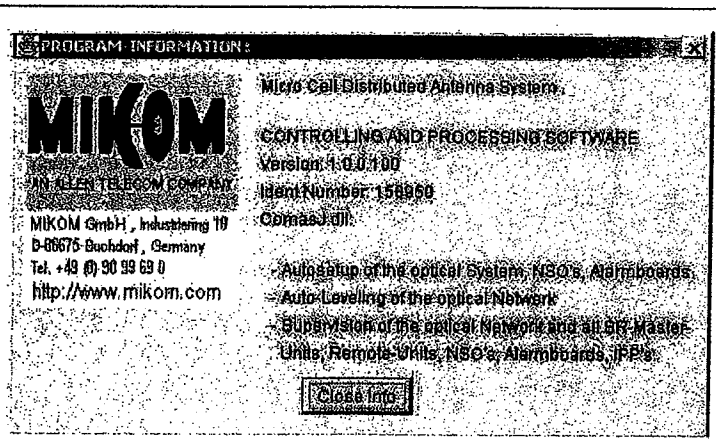
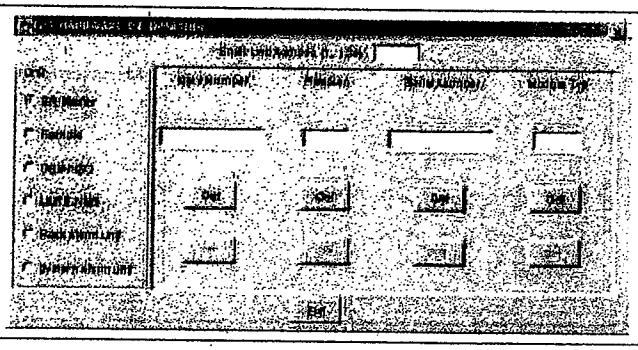
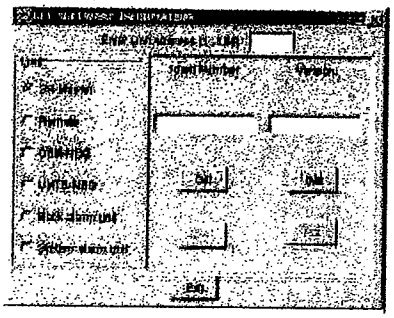
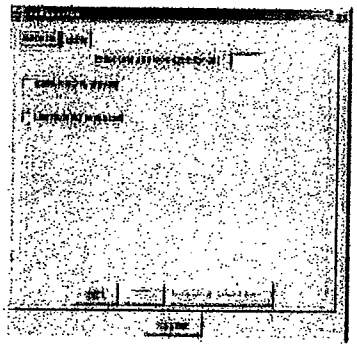
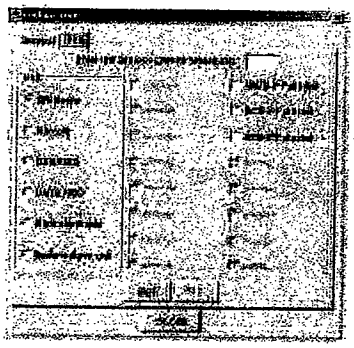


figure 6-8 Version Info menu

"This Software" Version of this software	

"Hardware Info" The Id-No., revision, serial no. and module type for a chosen type of unit (Master, Remote, GSM-NSO* or UMTS-NSO*) as well as the address are displayed.	
"Software Info" The Id-No., version and configuration for a chosen type of unit (Master, Remote, GSM-NSO* or UMTS-NSO*) as well as the address are displayed.	
"Configuration" In the "General" window the NSO's* for each remote unit (address) are placed if they are present. In the "Units" window the components installed in the indivdual units are placed.	 

*only available if the option is installed

6.4. THE TOOLBAR

With the cursor the toolbar can be pulled to each of the four sides of the window (four fixed positions: top, bottom, left and right). If it is pulled to another position, it is transformed into a floating toolbar. By closing the floating toolbar, the toolbar appears fixed at the top.

The buttons of the toolbar are equipped with popups (hold the cursor still on the button for 1sec).

The toolbar contains the following functions: Open System Port, Close System Port, Execute Auto-Setup, Start Auto-Polling and Stop Auto-Polling.

For your notes

7. APPENDIX

7.1. ILLUSTRATIONS

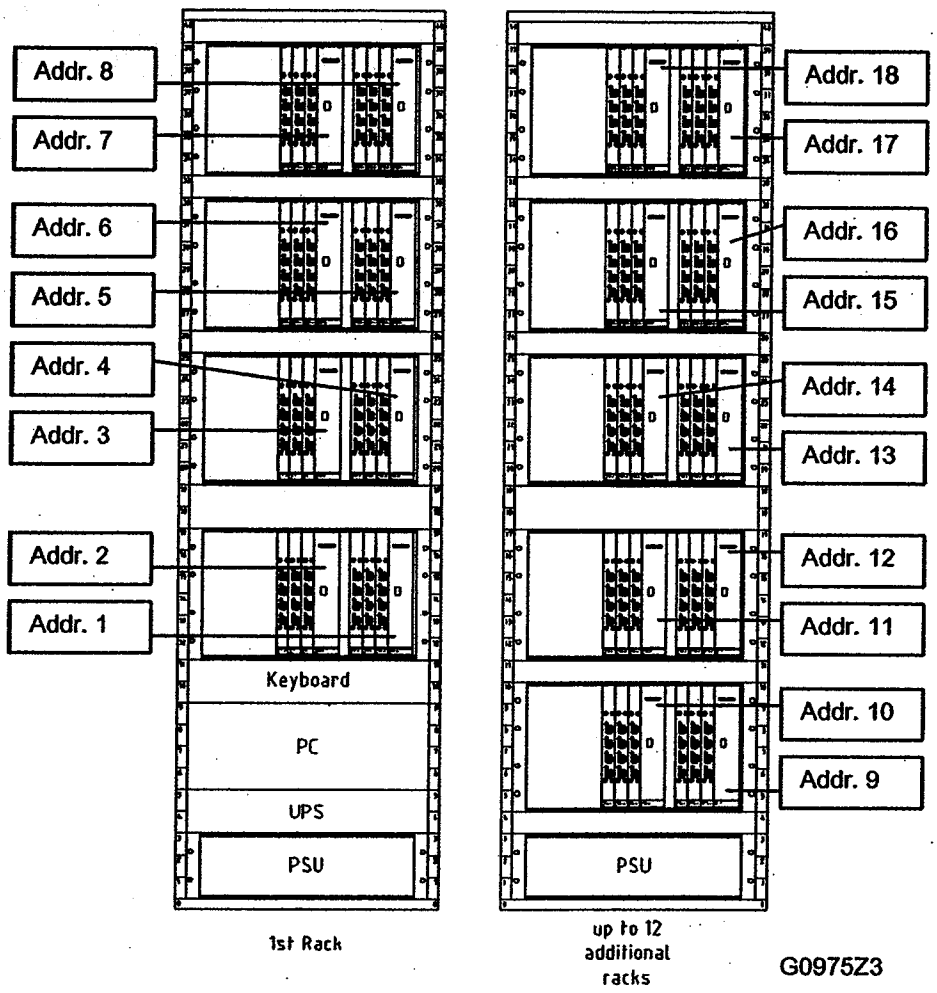


figure 7-1 Layout of rack, exemplary

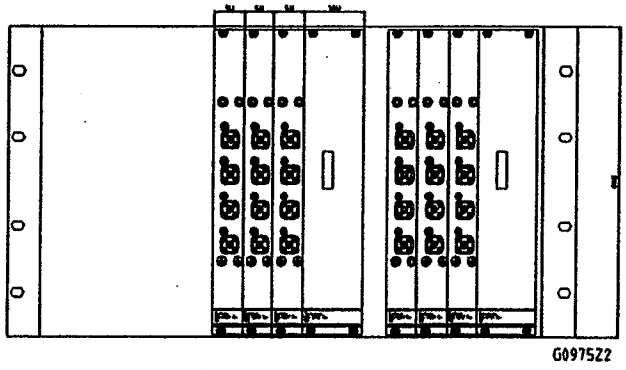


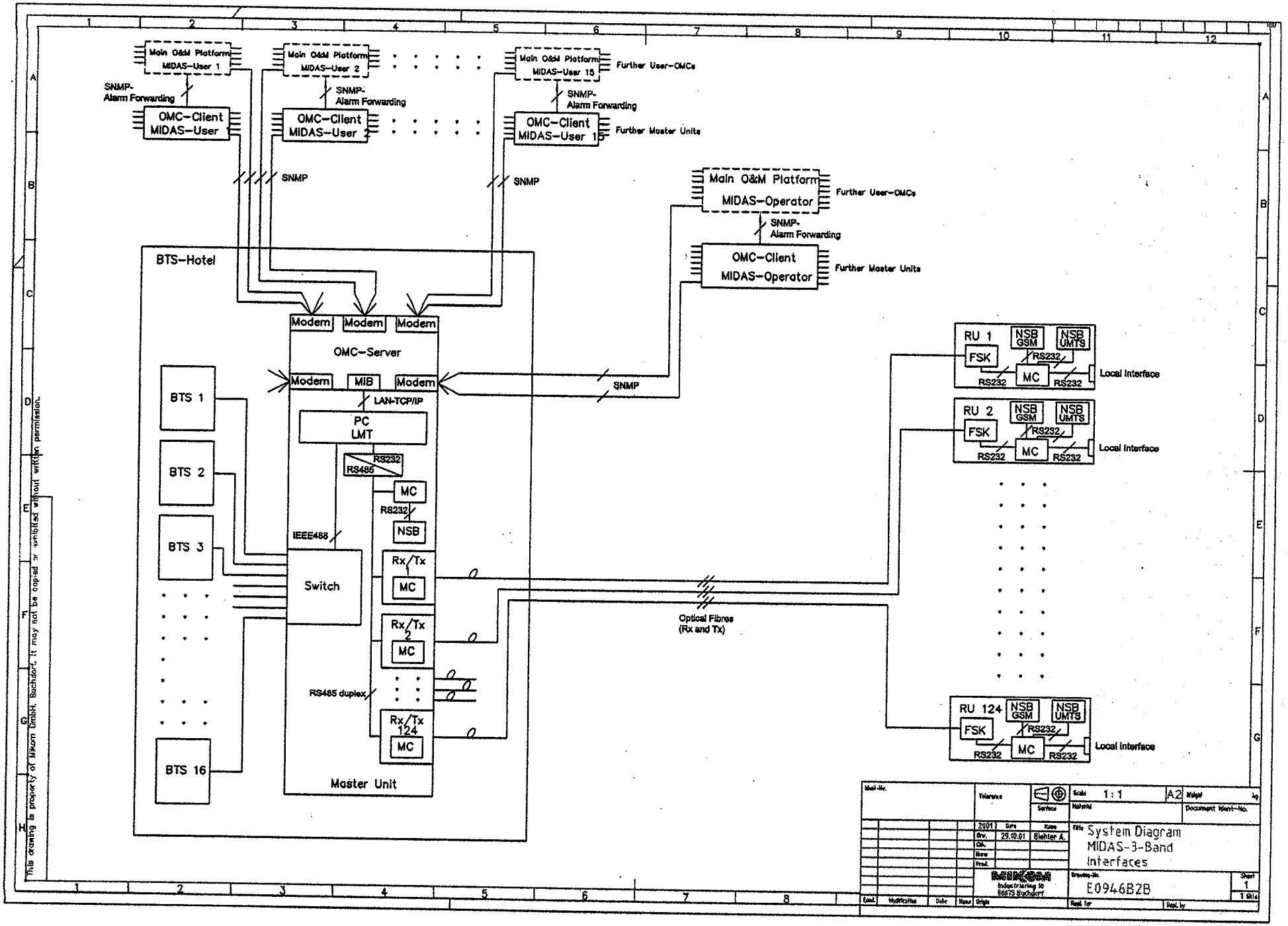
figure 7-2 Layout of subrack

7.4. SPARE PARTS LIST FOR MASTER UNIT 157868

Designation	*Id-No.*
Transceiver 3B	157786
Duplexer assembly	158131
Combiner 350-2200MHz 4-way w. attenuator	156237
Subrack 6HU	157400
Manual for Optical Master Unit	158393
Duplexer DCS MU 1710-1785/1805-1880MHz	150600
Duplexer EGSM UL:880-915MHz	148150
UMTS Duplexer MU UL:1920-1980MHz	155116
PC	157779
Monitor LCD 15"	158242
Smart UPS19" 230V 670W SU1000RMI2U	153169
MOXA interface card, Smart 8xRS232	157639
Power Supply In:230Vac±15%,40-65Hz	157187

Mikom reserves the right to replace the spare parts listed above by equivalent substitutes.

ATTACHMENT C


Main O&M Platform MIDAS-User 1
Main O&M Platform MIDAS-User 2
Main O&M Platform MIDAS-User 15
Further User-OMCs
SNMP-Alarm Forwarding
OMC-Client MIDAS-User
OMC-Client MIDAS-User 2
OMC-Client MIDAS-User 15
Further Master Units
SNMP
Main O&M Platform MIDAS-Operator
OMC-Client MIDAS-Operator
BTS-Hotel
Modem
OMC-Server
MIB
LAN-TCP/IP
PC LMT
RS232
RS485
MC
NSB
IEEE488
Switch
Rx/Tx
Rx/Tx 2
Rx/Tx 124
RS485 duplex
BTS 1
BTS 2
BTS 3
BTS 16
Master Unit
Optical Fibres (Rx and Tx)
RU 1
RU 2
RU 124
NSB GSM
NSB UMTS
FSK
Local Interface
This drawing is property of Nokom GmbH, Buchdorf. It may not be copied or exhibited without written permission.
Scale 1:1
A2
System Diagram MIDAS-3-Band Interfaces
E0946B2B

ATTACHMENT D

BTS/Node B Configuration

Operator	BTS Description	RF Lines	Patch Panel	External Ancillary Equipment Required before Master Un	Couplers	Coupler Size	Terminations (100 W for all)	2-Way Combiners	RF Lines
PCS	**Operator 1**								
PCS A_1	3 - Sector Macrocell, 2 RF ports (1x TX/RX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS A_2	3 - Sector Macrocell, 2 RF ports (1x TX/RX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS A_3	3 - Sector Macrocell, 2 RF ports (1x TX/RX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS	**Operator 2**								
PCS B_1	3 - Sector Macrocell, 2 RF ports (2x TX/RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS B_2	3 - Sector Macrocell, 2 RF ports (2x TX/RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS B_3	3 - Sector Macrocell, 2 RF ports (2x TX/RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS	**Operator 3**								
PCS B_1	3 - Sector Macrocell, 2 RF ports (2x TX/RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS B_2	3 - Sector Macrocell, 2 RF ports (2x TX/RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
PCS B_3	3 - Sector Macrocell, 2 RF ports (2x TX/RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
Cellular	**Operator 4**								
CELL A_1	3-Sector Macrocell, 2 RF ports (1 x TX/RX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
CELL A_2	3-Sector Macrocell, 2 RF ports (1 x TX/RX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
CELL A_3	3-Sector Macrocell, 2 RF ports (1 x TX/RX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	20	2	1	1
Trunking	**Operator 5**								
TRUNK A_1	3 - Sector Macrocell, 2 RF ports (1 x TX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	10	2	1	1
TRUNK A_2	3 - Sector Macrocell, 2 RF ports (1 x TX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	10	2	1	1
TRUNK A_3	3 - Sector Macrocell, 2 RF ports (1 x TX, 1 x RX	2		2 Couplers with Terminations; 2-way combiner to combine TX/RX and F	2	10	2	1	1

Operator	Number of Remotes	RF Splitters for RU combination before Master Unit	RU-90-01A	RU-90-09A	RU-90-08A	RU-90-07A	RU-90-13A	RU-90-17A	RU-90-21A	RU-90-26A	RU-90-23A	RU-90-33A	RU-90-36A	RU-90-37A	PHASE II	Total Remote Units
PCS																
PCS A_1	8	x 1:8 (or 1 x 1:2 and 2 x 1:4	1	1	1	1	1	1	1	1					0	8
PCS A_2	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)									1	1	1	1	4	8
PCS A_3	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)													8	8
PCS																
PCS C_1	8	x 1:8 (or 1 x 1:2 and 2 x 1:4	1	1	1	1	1	1	1	1					0	8
PCS C_2	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)									1	1	1	1	4	8
PCS C_3	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)													8	8
Cellular																
CELL A_1	8	x 1:8 (or 1 x 1:2 and 2 x 1:4	1			1			1			1			4	8
CELL A_2	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)		1			1			1			1		4	8
CELL A_3	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)			1			1			1			1	4	8

			RU-90-01B	RU-90-09B	RU-90-08B	RU-90-07B	RU-90-13B	RU-90-17B	RU-90-21B	RU-90-26B	RU-90-23B	RU-90-33B	RU-90-36B	RU-90-37B	PHASE II	
PCS																
PCS B_1	4	1 x 1:4	1	1	1	1									0	4
PCS B_2	4	1 x 1:4					1	1	1	1					0	4
PCS B_3	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)									1	1	1	1	4	8
Trunking																
TRUNK A_1	4	1 x 1:4	1			1			1			1			0	4
TRUNK A_2	8	x 1:8 (or 1 x 1:2 and 2 x 1:4)													8	8
TRUNK A_3	4	1 x 1:4			1			1			1			1	0	4

Master Unit Configuration